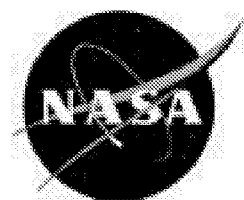


NASA/SP—2000—7037/SUPPL422
December 2000

AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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	Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft.	
02	Aerodynamics	3
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Typical Report Citation and Abstract

- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
3. Author(s) and Affiliation(s)
4. Publication Date
5. Contract/Grant Number(s)
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9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 422)

DECEMBER 2000

01

AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft.

20000115606 NASA Langley Research Center, Hampton, VA USA

Partners in Freedom: Contributions of the Langley Research Center to U.S. Military Aircraft of the 1990's

Chambers, Joseph R., NASA Langley Research Center, USA; October 2000; 273p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 522-24-11-20

Report No.(s): NASA/SP-2000-4519; NAS 1.21:4519; L-17965; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Established in 1917 as the nation's first civil aeronautics research laboratory under the National Advisory Committee for Aeronautics (NACA), Langley was a small laboratory that solved the problems of flight for military and civil aviation. Throughout history, Langley has maintained a working partnership with the Department of Defense, U.S. industry, universities, and other government agencies to support the defense of the nation with research. During World War II, Langley directed virtually all of its workforce and facilities to research for military aircraft. Following the war, a balanced program of military and civil projects was undertaken. In some instances Langley research from one aircraft program helped solve a problem in another. At the conclusion of some programs, Langley obtained the research models for additional tests to learn more about previously unknown phenomena. The data also proved useful in later developmental programs. Many of the military aircraft in the U.S. inventory as of late 1999 were over 20 years old. Langley activities that contributed to the development of some of these aircraft began over 50 years prior. This publication documents the role, from early concept stages to problem solving for fleet aircraft, that Langley played in the military aircraft fleet of the USA for the 1990's.

Author

Research Aircraft; Civil Aviation; Defense Program; Military Aircraft

20000116426 Federal Aviation Administration, Office of Aviation Policy and Plans, Washington, DC USA

Aviation Industry Overview, Fiscal Year 1999

Mar. 2000; 30p; In English

Report No.(s): PB2000-108306; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Contents include the following: Industry Overview; US Economic Outlook; Passenger Enplanements and Aircraft Departures; Traffic and Seat Capacity (57 Carriers); Financial Results (74 Carriers); Air Carrier Aircraft Orders and Deliveries; General Aviation Aircraft Shipments; FAA Workload Measures; Commercial Operations at Selected US Hubs; Traffic Demand, Seat Capacity, and Load Factors - Majors; Traffic Demand, Seat Capacity, and Load Factors - Nationals; Traffic Demand, Seat Capacity, and Load Factors - Large/Medium Regionals; Traffic Demand, Seat Capacity, and Load Factors - Selected Regionals/Commuters; Financial Results -Majors; Financial Results - Nationals; Financial Results - Large/Medium Regionals; Financial Results - Selected Regionals/Commuters; System Passenger Yields; Air Carrier Jet Fuel Prices.

NTIS

Aircraft Industry; Air Transportation

20000117687 NASA Langley Research Center, Hampton, VA USA

Aeronautical Engineering: A Continuing Bibliography, Supplement 421

November 2000; 72p; In English

Report No.(s): NASA/SP-2000-7037/SUPPL421; NAS 1.21:7037/SUPPL421; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This supplemental issue of Aeronautical Engineering, A Continuing Bibliography with Indexes (NASA/SP#2000-7037) lists reports, articles, and other documents recently announced in the NASA STI Database. The coverage includes documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated components, equipment, and systems. It also includes research and development in aerodynamics, aeronautics, and ground support equipment for aeronautical vehicles.

Author

Aeronautical Engineering; Bibliographies; Data Bases; Indexes (Documentation)

20000120286 NASA Glenn Research Center, Cleveland, OH USA

Experimental Replication of an Aeroengine Combustion Instability

Cohen, J. M., United Technologies Corp., USA; Hibshman, J. R., United Technologies Corp., USA; Proscia, W., United Technologies Corp., USA; Rosfjord, T. J., United Technologies Corp., USA; Wake, B. E., United Technologies Corp., USA; McVey, J. B., JbScienceS, USA; Lovett, J., Pratt and Whitney Aircraft, USA; Ondas, M., Pratt and Whitney Aircraft, USA; DeLaat, J., NASA Glenn Research Center, USA; Breisacher, K., NASA Glenn Research Center, USA; August 2000; 14p; In English; 45th; International Gas Turbine and Aeroengine Technical Congress, 8-11 May 2000, Munich, Germany; Sponsored by American Society of Mechanical Engineers, USA

Contract(s)/Grant(s): RTOP 523-26-13

Report No.(s): NASA/TM-2000-210250; E-12370; NAS 1.15:210250; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Combustion instabilities in gas turbine engines are most frequently encountered during the late phases of engine development, at which point they are difficult and expensive to fix. The ability to replicate an engine-traceable combustion instability in a laboratory-scale experiment offers the opportunity to economically diagnose the problem (to determine the root cause), and to investigate solutions to the problem, such as active control. The development and validation of active combustion instability control requires that the causal dynamic processes be reproduced in experimental test facilities which can be used as a test bed for control system evaluation. This paper discusses the process through which a laboratory-scale experiment was designed to replicate an instability observed in a developmental engine. The scaling process used physically-based analyses to preserve the relevant geometric, acoustic and thermo-fluid features. The process increases the probability that results achieved in the single-nozzle experiment will be scalable to the engine.

Author

Combustion Stability; Gas Turbine Engines; Experiment Design

20000120388 NASA Glenn Research Center, Cleveland, OH USA

Boby-Vortex Interaction, Sound Generation and Destructive Interference

Kao, Hsiao C., NASA Glenn Research Center, USA; August 2000; 46p; In English

Contract(s)/Grant(s): RTOP 714-04-50

Report No.(s): NASA/TM-2000-210239; E-12358; NAS 1.15:210239; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is generally recognized that interaction of vortices with downstream blades is a major source of noise production. To analyze this problem numerically, a two-dimensional model of inviscid flow together with the method of matched asymptotic expansions is proposed. The method of matched asymptotic expansions is used to match the inner region of incompressible flow to the outer region of compressible flow. Because of incompressibility, relatively simple numerical methods are available to treat multiple vortices and multiple bodies of arbitrary shape. Disturbances from vortices and bodies propagate outward as sound waves. Due to their interactions, either constructive or destructive interference may result. When it is destructive, the combined sound intensity can be reduced, sometimes substantially. In addition, an analytical solution to sound generation by the cascade-vortex interaction is given.

Author

Numerical Analysis; Aerodynamic Noise; Two Dimensional Models; Vortices; Noise Reduction

20000120403 NASA Glenn Research Center, Cleveland, OH USA

A Comparison of Vibration and Oil Debris Gear Damage Detection Methods Applied to Pitting Damage

Dempsey, Paula J., NASA Glenn Research Center, USA; September 2000; 18p; In English; 13th; Condition Monitoring and Diagnostic Engineering Management, 3-8 Dec. 2000, Houston, TX, USA; Sponsored by Society for Machinery Failure Prevention Technology

Contract(s)/Grant(s): RTOP 581-30-132

Report No.(s): NASA/TM-2000-210371; E-12423; NAS 1.15:210371; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Helicopter Health Usage Monitoring Systems (HUMS) must provide reliable, real-time performance monitoring of helicopter operating parameters to prevent damage of flight critical components. Helicopter transmission diagnostics are an important part of a helicopter HUMS. In order to improve the reliability of transmission diagnostics, many researchers propose combining two technologies, vibration and oil monitoring, using data fusion and intelligent systems. Some benefits of combining multiple sensors to make decisions include improved detection capabilities and increased probability the event is detected. However, if the sensors are inaccurate, or the features extracted from the sensors are poor predictors of transmission health, integration of these sensors will decrease the accuracy of damage prediction. For this reason, one must verify the individual integrity of vibration and oil analysis methods prior to integrating the two technologies. This research focuses on comparing the capability of two vibration algorithms, FM4 and NA4, and a commercially available on-line oil debris monitor to detect pitting damage on spur gears in the NASA Glenn Research Center Spur Gear Fatigue Test Rig. Results from this research indicate that the rate of change of debris mass measured by the oil debris monitor is comparable to the vibration algorithms in detecting gear pitting damage.

Author

Damage; Detection; Diagnosis; Debris; Gears; Pitting; Vibration

20000120907 Civil Aeromedical Inst., Oklahoma City, OK USA

The Impact of Teams on the Climate for Diversity in Government: The FAA Experience *Final Report*

Naff, Katherine C., San Francisco State Univ., USA; Thompson, Richard C, Civil Aeromedical Inst., USA; August 2000; 19p; In English

Contract(s)/Grant(s): AM-B-00-HRR-516

Report No.(s): AD-A382809; DOT/FAA/AM-00/27; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This study examined the effect of teamwork on diversity-related perceptions of the FAA workforce. Recent research suggests that one means of improving the diversity climate of an organization is through the implementation of terms. to access this conjecture in the FAA, three measures of diversity climate perceptions were examined: employee perceptions of the agency's success in elimination of hostile work environment behaviors, success of the Model Work Environment plan, and personal support of the model work environment vision. Team work and organization were examined, controlling for minority status, gender, age, supervisory status, agency and job tenure, and work setting. The results suggest that working as a member of an occupational work team is related to improved perceptions of the diversity climate, but organizational differences do exist. Overall, it appears that the size of the relationship between teamwork and diversity climate is influenced by the degree to which the survey measures focused on specific behaviors versus higher-level judgements. Specifically, behaviorally focused measures showed a stronger relationship with teamwork than did measures of support for the agency's diversity climate vision.

DTIC

Differences; Governments; Personnel; Employee Relations; Human Resources

02 AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery.

20000115622 Army Aviation and Missile Command, Army/NASA Rotorcraft Div., Moffett Field, CA USA

Evaluation of Airfoil Dynamic Stall Characteristics for Maneuverability

Bousman, William G., Army Aviation and Missile Command, USA; [2000]; 4p; In English; 26th; European Rotorcraft, 26-29 Sep. 2000, The Hague, Netherlands; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In severe maneuvers, out of necessity for a military aircraft or inadvertently for a civil aircraft, a helicopter airfoil will stall in a dynamic manner and provide lift beyond what would be calculated based on static airfoil tests. The augmented lift that occurs in dynamic stall is related to a vortex that is shed near the leading edge of the airfoil. However, directly related to the augmented lift that results from the dynamic stall vortex are significant penalties in pitching moment and drag. An understanding of the relationship between the augmented lift in dynamic stall and the associated moment and drag penalties is the purpose of this paper.

This relationship is characterized using data obtained in two-dimensional wind tunnel tests and related to the problem of helicopter maneuverability.

Derived from text

Aerodynamic Drag; Aerodynamic Stalling; Airfoils; Maneuverability; Pitching Moments

20000115874 NASA Langley Research Center, Hampton, VA USA

Numerical Simulation of Aircraft Trailing Vortices

Proctor, Fred H., NASA Langley Research Center, USA; Switzer, George F., Research Triangle Inst., USA; [2000], pp. 511-516; In English; 9th; Aviation, Range and Aerospace Meteorology, 11-15 Sep. 2000, Orlando, FL, USA; Sponsored by American Meteorological Society, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The increase in air traffic is currently outpacing the development of new airport runways. This is leading to greater air traffic congestion, resulting in costly delays and cancellations. The National Aeronautics and Space Administration (NASA) under its Terminal Area Productivity (TAP) program is investigating new technologies that will allow increased airport capacity while maintaining the present standards for safety. As an element of this program, the Aircraft Vortex Spacing System (AVOSS) is being demonstrated in July 2000, at Dallas Ft-Worth Airport. This system allows reduced aircraft separations, thus increasing the arrival and departure rates, while insuring that wake vortices from a leading aircraft do not endanger trailing aircraft. The system uses predictions of wake vortex position and strength based on input from the current weather state. This prediction is accomplished by a semi-empirical model developed from theory, field observations, and relationships derived from numerical wake vortex simulations. Numerical experiments with a Large Eddy Simulation (LES) model are being conducted in order to provide guidance for the enhancement of these prediction algorithms. The LES Simulations of wake vortices are carried out with NASA's Terminal Area Simulation System (TASS). Previous wake vortex investigations with TASS are described. The primary objective of these numerical studies has been to quantify vortex transport and decay in relation to atmospheric variables. This paper summarizes many of the previous investigations with the TASS model and presents some new results regarding the onset of wake vortex decay.

Author

Numerical Analysis; Vortices; Algorithms; Large Eddy Simulation; Safety; Wakes

20000115876 NASA Langley Research Center, Hampton, VA USA

Recent Improvements in Aerodynamic Design Optimization on Unstructured Meshes

Nielsen, Eric J., NASA Langley Research Center, USA; Anderson, W. Kyle, NASA Langley Research Center, USA; [2000]; 12p; In English; 39th; 39th Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-0596; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent improvements in an unstructured-grid method for large-scale aerodynamic design are presented. Previous work had shown such computations to be prohibitively long in a sequential processing environment. Also, robust adjoint solutions and mesh movement procedures were difficult to realize, particularly for viscous flows. To overcome these limiting factors, a set of design codes based on a discrete adjoint method is extended to a multiprocessor environment using a shared memory approach. A nearly linear speedup is demonstrated, and the consistency of the linearizations is shown to remain valid. The full linearization of the residual is used to precondition the adjoint system, and a significantly improved convergence rate is obtained. A new mesh movement algorithm is implemented and several advantages over an existing technique are presented. Several design cases are shown for turbulent flows in two and three dimensions.

Author

Computer Aided Design; Optimization; Computer Programs; Design Analysis; Unstructured Grids (Mathematics)

20000116077 Dynamac Corp., Cocoa Beach, FL USA

SOI, Groundwater, Surface Water, and Sediments of Kennedy Space Center, Florida: Background Chemical and Physical Characteristics

Shmalzer, Paul A., Dynamac Corp., USA; Hensley, Melissa A., Dynamac Corp., USA; Mota, Mario, Dynamac Corp., USA; Hall, Carlton R., Dynamac Corp., USA; Dunlevy, Colleen A., Dynamac Corp., USA; June 2000; 612p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS10-12180

Report No.(s): NASA/TM-2000-208583; NAS 1.15:208583; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

This study documented background chemical composition of soils, groundwater, surface water, and sediments of Kennedy Space Center. Two hundred soil samples were collected, 20 each in 10 soil classes. Fifty-one groundwater wells were installed in 4 subaquifers of the Surficial Aquifer and sampled; there were 24 shallow, 16 intermediate, and 11 deep wells. Forty surface

water and sediment samples were collected in major watershed basins. All samples were away from sites of known contamination. Samples were analyzed for organochlorine pesticides, aroclors, chlorinated herbicides, polycyclic aromatic hydrocarbons (PAH), total metals, and other parameters. All aroclors (6) were below detection in all media. Some organochlorine pesticides were detected at very low frequencies in soil, sediment, and surface water. Chlorinated herbicides were detected at very low frequencies in soil and sediments. PAH occurred in low frequencies in soil, shallow groundwater, surface water, and sediments. Concentrations of some metals differed among soil classes, with subaquifers and depths, and among watershed basins for surface water but not sediments. Most of the variation in metal concentrations was natural, but agriculture had increased Cr, Cu, Mn, and Zn.

Author

Soil Sampling; Ground Water; Chemical Composition; Aquifers; Contamination; Polycyclic Aromatic Hydrocarbons; Shallow Water; Watersheds

20000116138 Southampton Univ., Inst. of Sound and Vibration Research, UK

Structural Dynamics: Recent Advances, Volume 1

Ferguson, N. S.; Wolfe, H. F.; Ferman, M. A.; Rizzi, S. A.; Jul. 27, 2000; 753p; In English; 7th, 24-27 Jul. 2000, Southampton, UK

Contract(s)/Grant(s): F61775-00-W-F065

Report No.(s): AD-A382040; EOARD-CSP00-5065; ISBN 0-854-32721-5; Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

The final proceedings for seventh international conference on recent advances in structural dynamics, 24 July 2000 - 27 July 2000. Aeronautics and Flutter, Analytical Developments, Numerical Methods, Finite Element Methods, Nonlinear Vibration, Experimental Techniques, Rotating Machines, Control, System Identification, Acoustic Fatigue and Thermal Effects, Power Flow Approaches and Impact Dynamics.

Derived from text

Conferences; Dynamic Structural Analysis; System Identification

20000116143 Southampton Univ., Inst. of Sound and Vibration Research, UK

Structural Dynamics: Recent Advances, Volume 2

Ferguson, N. S.; Wolfe, H. F.; Freeman, M. A.; Rizzi, S. A.; Jul. 27, 2000; 333p; In English; 7th, 24-27 Jul. 2000, Southampton, UK

Contract(s)/Grant(s): F61775-00-W-F065

Report No.(s): AD-A382041; EOARD-CSP00-5065; ISBN 0-854-32721-5; Copyright; Avail: Defense Technical Information Center (DTIC)

The Final Proceedings for Seventh International Conference on Recent Advances in Structural Dynamics, 24 July 2000 - 27 July 2000 Aeronautics and Flutter; Analytical Developments; Numerical Methods; Finite Element Methods; Nonlinear Vibration; Experimental techniques; Rotating Machines; Control; System Identification; Acoustic Fatigue and Thermal Effects; Power Flow Approaches and Impact Dynamics.

DTIC

Fluid Dynamics; Conferences; Dynamic Response; Dynamic Structural Analysis

20000116154 Pennsylvania State Univ., Applied Research Lab., University Park, PA USA

Trailing Edge Noise Prediction: Large-Eddy Simulation of Wall Bounded Shear Flow Using the Nonlinear Disturbance Equations Final Report

Chyczewski, Thomas S.; Morris, Philip J.; Long, Lyle N.; Sep. 26, 2000; 18p; In English

Contract(s)/Grant(s): N00014-99-0290

Report No.(s): AD-A382346; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The potential benefits of using the Nonlinear Disturbance (NLD) equations, which govern flow variable fluctuations about an estimated mean, for the large-eddy simulation (LES) of wall bounded shear flows are investigated in this paper. In addition to verifying the suitability of the NLD equations for wall bounded flows, we build upon its advantages by introducing a new wall model that is easily and efficiently implemented within the NLD equation framework. The model implementation consists of defining a near wall region in which a modified linear set of equations are solved. The linear equation set allows disturbances to pass through and interact with the wall without altering the estimated mean. The streamwise and spanwise grid resolution of this near wall region can therefore be significantly relaxed while maintaining reasonable mean quantities such as skin friction. Comparisons of predicted turbulence intensity profiles and wall pressure spectra to experimental data for a fully developed

turbulent flat plate boundary layer are used to verify the suitability of the NLD equations for wall bounded flows. Preliminary results of a turbulent channel flow simulation are also presented to assess the new wall model.

DTIC

Large Eddy Simulation; Acoustic Simulation; Aeroacoustics; Trailing Edges; Aerodynamic Noise; Flat Plates; Turbulent Flow; Wall Flow; Turbulent Boundary Layer; Shear Flow

20000116408 Beam Technologies, Inc., Needham, MA USA

Application of Approximate Inertial Manifolds and Multiresolution Techniques to Parallel Computations of Sensitives and Design *Final Report, 15 Mar. 1995 - 14 Mar. 1998*

Berkooz, Gail; Mar. 14, 1998; 6p; In English

Contract(s)/Grant(s): F49620-95-C-0027

Report No.(s): AD-A381583; AFRL-SR-BL-TR-00-0415; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this work is to develop methodologies for the efficient computation of aerodynamic sensitivities using state-of-the-art CFD techniques for use in aerodynamic shape optimization and fluids-structure interaction analysis including: analysis of multiresolution schemes to compute sensitivities, analysis of parallel implementation issues in sensitivity computations, modification of a production CFD code for parallel multiresolution computation of sensitivities, integration of sensitivities into airframe optimization.

DTIC

Aerodynamic Configurations; Inertia; Parallel Processing (Computers)

20000116490 CFD Research Corp., Huntsville, AL USA

Development and Validation of Parallel Distributed Computing Environment for Aerostructural CFD Analysis *Final Report, May 1996-Oct 1999*

Harrand, Vincent J.; Parthasarathy, Viji; Sheta, Essam F.; Warren, Charles W.; Underwood, Mark L.; Feb. 2000; 73p; In English

Contract(s)/Grant(s): F33615-96-C-3002; AF Proj. 2404

Report No.(s): AD-A382632; A-9812; AFRL-VA-WP-TR-2000-3009; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Prediction and computer control of aeroelastic phenomena is a complex multi-disciplinary problem due to the interaction of aerodynamic, elastic and inertia forces on the aircraft structure. Lack of integration among computer programs that serve different disciplines, such as aerodynamics and structures, has posed a major obstacle to accurate aeroelastic analysis. The Multi-Disciplinary Computing Environment (MDICE) has been developed to help solve this problem. MDICE enables engineering analysis codes to perform coupled multi-disciplinary analysis in a distributed computing environment. A unique feature is that existing engineering analysis codes are being used with a high level of interoperability and interchangeability.

DTIC

Aircraft Structures; Computational Fluid Dynamics; Computer Programs; Parallel Processing (Computers); Distributed Processing; Architecture (Computers); Computation

20000119048 NASA Ames Research Center, Moffett Field, CA USA

NASA Wingtip Code Validation Grid

Ziliac, Greg, NASA Ames Research Center, USA; Mariani, Jennifer Dacles, NASA Ames Research Center, USA; September 1995; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

I have been contacted by Alan Celic to request the computational fluid dynamics (CFD) grid file for the NASA Wingtip CFD validation case. Alan is currently a Ph.D. student at the University of Stuttgart in Germany and spent a year here at Ames Research Center (ARC) as an Ames Associate. This case is a standard validation case studied by many within the U.S. The case is of the flow around a rectangular wing with a rounded wing tip. The airfoil is a NACA 0012. There is nothing special or unusual about the geometry or the grid file. The grid file is a single-zone grid with 2.5 million points. This geometry is generic and is not similar to any currently flying vehicle. All of the results published by NASA, as part of this study, (completed in 1995) are currently in the public domain.

Author

Airfoils; Computational Fluid Dynamics; Rectangular Wings; Wing Tips

20000120059 Embry-Riddle Aeronautical Univ., Aerospace Engineering Dept., Prescott, AZ USA

Aerodynamic Evaluation of Tip Mounted Jet Nacelles

Gally, Thomas A., Embry-Riddle Aeronautical Univ., USA; 2000 NASA-HU American Society for Engineering Education

(ASEE) Summer Faculty Fellowship Program; September 2000, pp. 55; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A computational investigation into the aerodynamic effects of a wing tip mounted jet nacelle was undertaken in order to verify and expand upon information gained in previous experimental studies. In those experimental studies, the presence of a powered turbo-fan on the wing tip indicted the potential for significant performance gains through induced drag reduction and improved flight operation safety through the reduction in the strength of the trailing wake vortex system. This computational study seeks to quantify the performance gains into a form usable for preliminary design studies and to increase the level of understanding of the flow mechanisms involved. Results obtained using both an inviscid computational fluid dynamics (CFD) analysis and a simple vortex lattice model are similar to the performance gains seen in the experiment work. The source of these gains can be attributed to the redistribution of the wing tip vortex over the radial surface of the nacelle. As such, this effect is dependent upon the relative engine nacelle size, but largely independent of the mass flow through the engine and, thus, the engine power setting. The trailing wake vortex system is also favorably effected by the presence of a wing tip nacelle. For a simple flow-through nacelle, the vortex strength and the rate of vortex roll up appear to be reduced due to the redistributed and dispersed wing tip vortex. When air is forced through the nacelle, further reduction of the vortex strength is seen via the shearing action between the nacelle exhaust and ambient airflow. The greater the velocity difference between nacelle and ambient flow, the greater is this shearing dispersion of the vortex energy. It may also be possible to induce an early bursting of the wing tip vortex by forcing air through the nacelle and thus through the core of the wing tip vortex. Such vortex bursting would greatly reduce the trailing vortex strength and, if it occurs close enough behind the wing, may provide an additional performance benefit. Some evidence of this vortex bursting was seen in the computational results, however, additional work to build confidence in the computational modeling needs to be done before strong conclusions can be made.

Author

Nacelles; Wing Tip Vortices; Aerodynamics; Research and Development

20000120069 Alaska Univ. Fairbanks, History Dept., Nome, AK USA

NASA and a Second-Generation Supersonic Transport

Millbrooke, Anne, Alaska Univ. Fairbanks, USA; 2000 NASA-HU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; September 2000, pp. 66; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

On Tuesday 25 July 2000 a Concorde crashed after takeoff from the Charles de Gaulle airport in Paris. All 109 people on board and 4 people on the ground died. This was the first crash of a supersonic transport in commercial operation. Reuters news service announced that the 'Crash Casts Gloom on European Aviation Industry.' The BBC concluded that the crash was the 'end of a French national symbol.' Time Europe asked, 'Will the tragedy cloud the future of supersonic flight?' A British-French consortium made the Concorde, and the Tupolev design bureau in the Soviet Union made the supersonic TU-144 transport, both of which entered production and service in the mid 1970s. Despite decades of supersonic research and development in the USA, the USA has never built a supersonic transport. NASA's High Speed Research Program was the agency's 'top priority' of the 1990s, yet in 1999 the USA stopped development of a second-generation supersonic transport. Why? In the 1940s the National Advisory Committee on Aeronautics (NACA) conducted diveflight research, dropped airplane models from airplanes, fired small solid-propellant rockets, and experimented with rocket-propelled aircraft to explore the speed limits of flight. The research plane became the research tool of choice for studying supersonic flight in the late '40s and early '50s. The military services sponsored the development of the research planes, contractors built the planes, and the NACA served as research coordinator. These parties developed and tested specialized aerodynamic research airplanes, the first of which was the Bell X-1. Air Force Captain Chuck Yeager flew the X-1 faster than the speed of sound on 14 October 1947. by the late 1950s NACA had developed, constructed and placed into operation highspeed wind tunnels and initiated research into supersonic cruise technology. This research continued under NACA's successor - NASA. In 1960 NASA established a Supersonic Transport (SST) research program. The USA cancelled its SST program in 1971 because of environmental and economic concerns, while the British-French team produced the Concorde, and the Soviet Union the Tupolev TU-144. After the SST program, NASA maintained a core competency and continued research in the supersonic field. In the mid 1980s NASA began to explore the feasibility of a second-generation supersonic High Speed Civil Transport (HSCT), and in 1990 the agency began a High Speed Research Program (HSRP) to develop the technology foundation for such an aircraft. The research involved enabling propulsion materials, critical propulsion components, aerodynamic performance, airframe materials and structures, flight deck systems, technology integration, and environmental impact. Overall, the High Speed Research Program produced impressive results, notably computer models, composite materials, and synthetic vision, but the program closed in 1999. This time the core competency went with the program, as the engineers and scientists dispersed to other jobs on other projects inside and outside of NASA. The aircraft under consideration was neither environmentally acceptable nor economically viable, and, given the changing world market and

increasingly restrictive environmental standards, there was no promise of near-term solution of the economic and environmental problems.

Author

Research and Development; Research Aircraft; Supersonic Flight; Technology Utilization

20000120079 Old Dominion Univ., Dept. of Mechanical Engineering, VA USA

Aerodynamic Uncertainty Studies

Taylor, Arthur C., III, Old Dominion Univ., USA; 2000 NASA-HU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; September 2000, pp. 76; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The use of aerodynamic sensitivity derivatives is explored in the context of aerodynamic uncertainty analysis using nonlinear computation fluid dynamics (CFD) codes. Well-known formulae are employed to predict the mean and variance of an aerodynamic output function which is subjected to a normally-distributed, randomly-variable set of design parameters. Each of these predictive formulae has a first-order accurate version and a second-order accurate version; the latter requires that the second-order aerodynamic sensitivity derivatives be calculated (in addition to the first-order derivatives, of course). The proposed methodology is demonstrated in application to the quasi-1D Euler equations for transonic flow with a normal shock in a converging-diverging nozzle. The sensitivity-based predictive methods are compared with results generated directly from a Monte Carlo simulation using the CFD code. Work-in-progress is reviewed with respect to extension of the methodology to transonic flow over an airfoil (i.e., 2D). Finally, special issues and difficulties associated with computing the second-order aerodynamic sensitivity derivatives are reviewed.

Author

Aerodynamics; Computational Fluid Dynamics; Sensitivity; Derivation

20000120145 NASA Langley Research Center, Hampton, VA USA

Analysis of Post-Support and Wind-Tunnel Wall Interference on Flow Field About Subsonic High-Lift High-Speed Research Configuration

Lessard, Wendy B., NASA Langley Research Center, USA; November 2000; 45p; In English

Contract(s)/Grant(s): RTOP 537-07-51-02

Report No.(s): NASA/TP-2000-210555; L-17806; NAS 1.60:210555; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present study was performed to determine how significant the interference effects of the wind-tunnel model support system and tunnel walls can be for a high-speed configuration during takeoff and landing conditions. A 5-percent scale model of the Technology Concept Airplane was recently tested in the Langley 14- by 22-Foot Sub-sonic Tunnel. The model was numerically modeled with and without the support and tunnel walls and compared with experimental data. Detailed analysis of the flow provided additional insight concerning what effects the post support and tunnel walls had on the flow field. This study revealed that although the overall forces and moments could be experimentally accounted for, the detailed flow features, such as the surface pressure distributions, could not be accurately simulated without including the post support in the computations.

Author

Computational Fluid Dynamics; Scale Models; Support Systems; Wind Tunnel Models; Wind Tunnel Walls; Computational Grids

20000120148 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Evaluation of the Lattice-Boltzmann Equation Solver PowerFLOW for Aerodynamic Applications Final Report

Lockard, David P., NASA Langley Research Center, USA; Luo, Li-Shi, Institute for Computer Applications in Science and Engineering, USA; Singer, Bart A., NASA Langley Research Center, USA; October 2000; 37p; In English

Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01

Report No.(s): NASA/CR-2000-210550; NAS 1.26:210550; ICASE-2000-40; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A careful comparison of the performance of a commercially available Lattice-Boltzmann Equation solver (Power-FLOW) was made with a conventional, block-structured computational fluid-dynamics code (CFL3D) for the flow over a two-dimensional NACA-0012 airfoil. The results suggest that the version of PowerFLOW used in the investigation produced solutions with large errors in the computed flow field; these errors are attributed to inadequate resolution of the boundary layer for reasons related to grid resolution and primitive turbulence modeling. The requirement of square grid cells in the PowerFLOW calculations limited the number of points that could be used to span the boundary layer on the wing and still keep the computation

size small enough to fit on the available computers. Although not discussed in detail, disappointing results were also obtained with PowerFLOW for a cavity flow and for the flow around a generic helicopter configuration.

Author

Boltzmann Transport Equation; Turbulence Models; Boundary Layers; Computer Programs; Computational Fluid Dynamics

20000120451 Ohio State Univ., Columbus, OH USA

DIIC-6 Twin Otter Tailplane Airfoil Section Testing in the Ohio State University 7x10 Wind Tunnel, Volume 1 Final Report

Hiltner, Dale, Ohio State Univ., USA; McKee, Michael, Ohio State Univ., USA; LaNoe, Karine, Ohio State Univ., USA; Gregorek, Gerald, Ohio State Univ., USA; September 2000; 114p; In English

Contract(s)/Grant(s): NAG3-1574; RTOP 548-21-23

Report No.(s): NASA/CR-2000-209921/VOL1; E-12159/VOL1; NAS 1.26:209921/VOL1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Ice contaminated tailplane stall (ICTS) has been found to be responsible for 16 accidents with 139 fatalities over the last three decades, and is suspected to have played a role in other accidents and incidents. The need for fundamental research in this area has been recognized at three international conferences sponsored by the FAA since 1991. In order to conduct such research, a joint NASA/FAA Tailplane Icing Program was formed in 1994: the Ohio State University has played an important role in this effort. The program employs icing tunnel testing, dry wind tunnel testing, flight testing, and analysis using a six-degrees-of-freedom computer code tailored to this problem. A central goal is to quantify the effect of tailplane icing on aircraft stability and control to aid in the analysis of flight test procedures to identify aircraft susceptibility to ICTS. This report contains the results of testing of a full scale 2D model of a tailplane section of NASA's Icing Research Aircraft, with and without ice shapes, in an Ohio State University 7 x 10 Low Speed wind tunnel in 1994. The results have been integrated into a comprehensive database of aerodynamic coefficients and stability and control derivatives that will permit detailed analysis of flight test results with the analytical computer program. The testing encompassed a full range of angles of attack and elevator deflections, as well as two velocities to evaluate Reynolds number effects. Lift, drag, pitching moment, and hinge moment coefficients were obtained. In addition, instrumentation for use during flight testing was verified to be effective, all components showing acceptable fidelity. Comparison of clean and iced airfoil results show the ice shapes causing a significant decrease in the magnitude of CL_{max} (from -1.3 to -0.64) and associated stall angle (from -18.6 deg to -8.2 deg). Furthermore, the ice shapes caused an increase in hinge moment coefficient of approximately 0.02, the change being markedly abrupt for one of the ice shapes. A noticeable effect of elevator deflection is that magnitude of the stall angle is decreased for negative (upward) elevator deflections. All these results are consistent with observed tailplane phenomena, and constitute an effective set of data for comprehensive analysis of ICTS

Author

De Havilland Aircraft; Research Aircraft; Aircraft Icing; Horizontal Tail Surfaces; Airfoil Profiles; Aircraft Stability; Computer Programs

20000121154 NASA Langley Research Center, Hampton, VA USA

Computer Programs for Calculating the Isentropic Flow Properties for Mixtures of R-134a and Air

Kvaternik, Raymond G., NASA Langley Research Center, USA; November 2000; 127p; In English

Contract(s)/Grant(s): RTOP 522-31-21-05

Report No.(s): NASA/TM-2000-210622; L-18028; NAS 1.15:210622; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Three computer programs for calculating the isentropic flow properties of R-134a/air mixtures which were developed in support of the heavy gas conversion of the Langley Transonic Dynamics Tunnel (TDT) from dichlorodifluoromethane (R-12) to 1,1,1,2 tetrafluoroethane (R-134a) are described. The first program calculates the Mach number and the corresponding flow properties when the total temperature, total pressure, static pressure, and mole fraction of R-134a in the mixture are given. The second program calculates tables of isentropic flow properties for a specified set of free-stream Mach numbers given the total pressure, total temperature, and mole fraction of R-134a. Real-gas effects are accounted for in these programs by treating the gases comprising the mixture as both thermally and calorically imperfect. The third program is a specialized version of the first program in which the gases are thermally perfect. It was written to provide a simpler computational alternative to the first program in those cases where real-gas effects are not important. The theory and computational procedures underlying the programs are summarized, the equations used to compute the flow quantities of interest are given, and sample calculated results that encompass the operating conditions of the TDT are shown.

Author

Computer Programs; Isentrope; Flow Characteristics; Gas Mixtures; Refrigerants; Air; Mixtures

20000121203 NASA Langley Research Center, Hampton, VA USA

Determining Aerodynamic Loads Based on Optical Deformation Measurements

Liu, Tianshu, NASA Langley Research Center, USA; Barrows, D. A., NASA Langley Research Center, USA; Burner, A. W., NASA Langley Research Center, USA; Rhew, R. D., NASA Langley Research Center, USA; [2001]; 12p; In English; 39th; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA Report No.(s): AIAA Paper 2001-0560; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a videogram metric technique for determining aerodynamic loads based on optical elastic deformation measurements. The data reduction methods are developed to extract the normal force and pitching moment from beam deformation data. The axial force is obtained by measuring the axial translational motion of a movable shaft in a spring/bearing device. Proof-of-concept calibration experiments are conducted to assess the accuracy of this optical technique.

Author

Aerodynamic Loads; Calibrating; Data Reduction; Elastic Deformation; Shafts (Machine Elements)

20000121220 Ohio State Univ., Columbus, OH USA

Additional Testing of the DHC-6 Twin Otter Tailplane Iced Airfoil Section in the Ohio State University 7x10 Low Speed Wind Tunnel, Volume 2

Gregorek, Gerald, Ohio State Univ., USA; Dresse, John J., Ohio State Univ., USA; LaNoe, Karine, Ohio State Univ., USA; September 2000; 88p; In English

Contract(s)/Grant(s): NAG3-1574; RTOP 548-21-23

Report No.(s): NASA/CR-2000-209921/VOL2; NAS 1.26:209921/VOL2; E-12159-2; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The need for fundamental research in Ice Contaminated Tailplane Stall (ICTS) was established through three international conferences sponsored by the FAA. A joint NASA/FAA Tailplane Icing Program was formed in 1994 with the Ohio State University playing a critical role for wind tunnel and analytical research. Two entries of a full-scale 2-dimensional tailplane airfoil model of a DHC-6 Twin Otter were made in The Ohio State University 7x10 ft wind tunnel. This report describes the second test entry that examined additional ice shapes and roughness, as well as airfoil section differences. The addition data obtained in this test fortified the original database of aerodynamic coefficients that permit a detailed analysis of flight test results with an OSU-developed analytical program. The testing encompassed a full range of angles of attack and elevator deflections at flight Reynolds number conditions. Aerodynamic coefficients, $C(L)$, $C(M)$, and $C(He)$, were obtained by integrating static pressure coefficient, $C(P)$, values obtained from surface taps. Comparisons of clean and iced airfoil results show a significant decrease in the tailplane aeroperformance (decreased $C(L_{max})$, decreased stall angle, increased $C(He)$) for all ice shapes with the grit having the least affect and the LEWICE shape having the greatest affect. All results were consistent with observed tailplane stall phenomena and constitute an effective set of data for comprehensive analysis of ICTS.

Author

De Havilland Aircraft; Horizontal Tail Surfaces; Wind Tunnel Tests; Aerodynamic Coefficients; Airfoil Profiles; Aircraft Icing; Aircraft Performance; Low Speed Wind Tunnels

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation.

20000116070 National Transportation Safety Board, Washington, DC USA

Safety Recommendation

Hall, Jim, National Transportation Safety Board, USA; Jun. 16, 2000; 64p; In English

Report No.(s): AD-A380065; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Contents include the following: Air traffic control operational procedures. Reporting investigation of ATC-related events. Near midair collision reporting. Air traffic control data retention. use of unrecorded telephone lines in ATC facilities.

CASI

Air Traffic Control; Safety; Midair Collisions; Recommendations

20000116199 NASA Langley Research Center, Hampton, VA USA

A Windshear Hazard Index

Proctor, Fred H., NASA Langley Research Center, USA; Hinton, David A., NASA Langley Research Center, USA; Bowles, Roland L., Aero Tech Research, Inc., USA; [2000], pp. 482-487; In English; 9th; Aviation, Range and Aerospace Meteorology, 11-15 Sep. 2000, Orlando, FL, USA; Sponsored by American Meteorological Society, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An aircraft exposed to hazardous low-level windshear may suffer a critical loss of airspeed and altitude, thus endangering its ability to remain airborne. In order to characterize this hazard, a nondimensional index was developed based on aerodynamic principals and understanding of windshear phenomena, 'This paper reviews the development and application of the Bowles F-factor, which is now used by onboard sensors for the detection of hazardous windshear. It was developed and tested during NASA/I:AA's airborne windshear program and is now required for FAA certification of onboard radar windshear detection systems. Reviewed in this paper are: 1) definition of windshear and description of atmospheric phenomena that may cause hazardous windshear. 2) derivation and discussion of the F-factor. 3) development of the F-factor hazard threshold, 4) its testing during field deployments, and 5) its use in accident reconstructions,

Author

Deployment; Detection; Hazards; Losses; Wind Shear

20000116302 Civil Aeromedical Inst., Oklahoma City, OK USA

A Unique Contact Lens-Related Airline Aircraft Accident *Final Report*

Nakagawara, Van B.; Veronneau, Stephen J.; May 2000; 9p; In English

Report No.(s): AD-A379287; DOT/FAA/AM-00/18; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The use of contact lenses to satisfy the distant visual acuity requirements for obtaining a civil airman medical certificate has been permitted since 1976. According to the Federal Aviation Administration's "Guide for Aviation Medical Examiners," the use of monovision contact lenses is not considered acceptable for aviation duties. An aviation accident involving the use of monovision contact lenses will be reviewed. A case report is presented utilizing information from a National Transportation Safety Board (NTSB) aircraft accident report (NTSB/AAR-97/03) of a nonfatal scheduled airline accident. Past studies that examined the use of contact lenses in the aviation environment are reviewed. On October 19, 1996, a McDonnell Douglas MD-88 aircraft, Delta Airlines Flight 554, was substantially damaged in an undershoot approach while landing at LaGuardia Airport, Flushing, NY. Weather observations indicated a broken cloud layer at 800 feet, visibility between 1/2 and 1 mile in heavy rain and fog or mist, and easterly winds at 12 to 14 knots. The approach was over water to Runway 13 and the flight crew transitioned to visual references just above the decision height. As the airplane continued to descend, it struck an approach light structure and the end of the runway deck, shearing off the main landing gear and slid 2,700 feet down the runway. During an emergency evacuation, 3 passengers received minor injuries. The NTSB determined that the probable cause of this accident was the inability of the pilot to overcome his misperception of the airplane's position relative to the runway, due to the use of monovision contact lenses. The adverse effects of wearing contact lenses in the aviation environment are discussed. Research is recommended to better understand the effects of environmental conditions on monovision to validate the current policy on such corrections.

DTIC

Contact Lenses; Aerospace Medicine; Aircraft Accidents; Flight Crews; Safety Management

20000116365 Army Safety Center, Fort Rucker, AL USA

Index to U.S. Army Safety Publications

Jul. 1993; 24p; In English

Report No.(s): AD-A382365; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

"And there I was, smack in the middle of a good free-for-all discussion and, while I just knew I was right, I couldn't remember the reference!" How many times has that happened to you when challenged to "go to the book"? Such a situation is what led Al Cargen, then an Air Safety Specialist with Aviation Division, Headquarters, 5th U.S. Army to put together the original quick reference listing of subjects to directives. This edition is the fourth update of that original listing and, while it may not contain every possible subject you may run into, it's a good start in that direction. and now, properly armed, it's back to the "campfire" to dazzle your buddies-unless, of course, they also have a copy. Al Cargen is currently owner of the Aviation Safety Organization headquartered in San Antonio, TX. His organization compiled the basic information and provided it free of charge to the Army Safety Center. The information is intended to serve as a quick reference. Because of the changing nature of publications, only the

basic reference is noted in most cases (annotations to page and paragraph numbers have been omitted unless considered critical or to avert possible confusion).

DTIC

Aircraft Safety; Indexes (Documentation); Documents; Armed Forces

20000116424 Disability Rights Education and Defense Fund, Berkeley, CA USA

Enforcing the Civil Rights of Air Travelers with Disabilities: Recommendations for the Department of Transportation and Congress

Blank, K.; Feb. 26, 1999; 176p; In English

Report No.(s): PB2000-108226; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

This report is the first in a series of four that will evaluate the effectiveness of federal enforcement of disability civil rights laws. This report focuses on federal enforcement of ACAA. As the economy becomes increasingly global, the ability of employees with disabilities to travel by air is critical to their success and upward mobility.

NTIS

Civil Aviation; Air Transportation; Laws

20000116481 Massachusetts Inst. of Tech., Lincoln Laboratory, Lexington, MA USA

Comparison of Active TCAS Slant Range Measurements with Interpolated Passive Position Reports for Use in Hybrid Surveillance Applications: Measurements from the June 1999 Los Angeles Basin Flight Tests

Thompson, S. D.; October 17, 2000; 126p; In English; Original contains color illustrations

Report No.(s): PB2001-100753; ATC-294; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Traffic Alert and Collision Avoidance System (TCAS) hybrid surveillance is a technique that makes use of both active surveillance data from the interrogation reply sequence and passive position estimates received from mode S extended squitters. This technique allows TCAS to use passive surveillance once the data have been validated by comparison with active data. The maximum allowable range difference for validation specified by the International Civil Aviation Organization (ICAO) is 200 meters. Data from twenty encounters recorded during flight tests conducted in the Los Angeles Basin in June 1999 were analyzed. The results show that the ICAO specified limits were never exceeded and serve to validate the 200 meter limit.

NTIS

Air Traffic Control; Collision Avoidance; Warning Systems; Aircraft Safety; Midair Collisions

20000116507 General Accounting Office, Washington, DC USA

Aviation Security: Additional Controls Needed to Address Weaknesses in Carriage of Weapons Regulations

September 2000; 50p; In English

Report No.(s): PB2001-100547; GAO/RCED-00-181; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our objectives in this report were to determine the frequency with which law enforcement officers carry weapons on board commercial aircraft and to determine if the weapons carriage regulations both current and proposed are sufficient to ensure the safety of passengers and the security of aircraft. To achieve these objectives, we interviewed representatives from FAA, the 10 major airlines, and 3 law enforcement officer associations. We also reviewed FAAs current and proposed weapons carriage regulations and the comments that FAA received in response to the proposed changes to the regulation. Finally, we searched a National Aeronautics and Space Administration (NASA) database that contains voluntary reports of incidents related to aviation safety to find problems associated with weapons carried by law enforcement officers on board aircraft.

NTIS

Weapons; Police; Commercial Aircraft; Regulations; Civil Aviation

20000116603 Texas A&M Univ., Texas Transportation Inst., College Station, TX USA

Evaluation of the Role and Needs of Agricultural Airports in Texas, Sep. 1998 - Aug. 1999

Borowiec, J. D.; Dresser, G. B.; May 2000; 116p; In English

Report No.(s): PB2000-108072; TX-99/1951-S; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

This study examines the role and needs of airports that serve the agricultural communities in Texas. The significance of agriculture to the state is addressed and agricultural airports are identified. The major crops produced in the state are categorized by region and the level of aerial application activity, the economic significance of the state's crops, and the technological trends

of the agricultural aircraft industry. Specific recommendations are presented with respect to supporting agricultural airports through the planning and programming process.

NTIS

Aircraft Industry; Agricultural Aircraft; Airports

20000119072 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Aviation Commissioned Officer Skill Development: How Changes to Force Structure and Key Aviation Publications have Impacted the Junior Officer's Skills

Quackenbush, Robert B.; Jun. 02, 2000; 123p; In English

Report No.(s): AD-A382933; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis examines the changes that have taken place in doctrinal aviation training manuals, aviation regulations, and career development guidelines for commissioned aviation officers. The intent is to determine how Aviation Branch, through the evolution of these key publications, has affected the skill development of commissioned officers. Additionally, this thesis compares current aviation tables of organization and equipment to past "H" series tables of organization and equipment organizations as well as current tables for the other combat arms branches. This comparison is to determine whether or not current force structures cause aviation officers to spend significantly more time in staff rather than line positions compared to their predecessors and their combat arms peers. This study concludes that the capstone aviation regulations, training manuals, and career development guidelines have, over time, gradually de-emphasized the development of flight skills for the commissioned officer. Additionally, the study concludes that aviation officers have less, and in some cases, much less opportunity to serve in line positions than did their predecessors and current combat arms peers because today's aviation force structures have disproportionate staff to line officer ratios.

DTIC

Education; Personnel Development; Military Aviation; Training Analysis

20000119079 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA

Aviation Security Additional Controls Needed to Address Weaknesses in Carriage of Weapons Regulations

Sep. 2000; 45p; In English

Report No.(s): AD-A383114; GAO/RCED-00-181; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The number of law enforcement officers who fly while armed is unknown because neither FAA nor the airlines systematically collect this information. However, we obtained anecdotal information that provides some perspective on the number of officers who fly while armed. For example, one U.S. carrier reported to us that it carried over 3,000 armed law enforcement officers each month during a 3-month period. Another U.S. carrier reported to us that it carried about 100 officers each month during an 8-month period. We are recommending that FAA work with the airlines to collect and assess information on how frequently law enforcement officers carry firearms on board aircraft. At a minimum, this information will enable FAA to assess the extent to which the agency is achieving its goal of reducing weapons carried by law enforcement officers on commercial aircraft.

DTIC

Airline Operations; Weapons; Police

20000119959 Army Safety Center, Fort Rucker, AL USA

Flightfax, Volume 28

June 2000; 12p; In English

Report No.(s): AD-A378327; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This article takes a close look at the relationship between safety and maintenance. Discussions include foreign object damage, fuel handling, and behavioral safety.

DTIC

Armed Forces; Fighter Aircraft; Risk; Management Information Systems; Safety

20000120067 Virginia Univ., Systems Engineering Dept., Charlottesville, VA USA

A Risk-Based Method for Evaluating NASA Technology for the National Airspace System

Louis, Garrick E., Virginia Univ., USA; 2000 NASA-HU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; September 2000, pp. 64; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Aviation Safety Program at NASA has traditionally relied on accident data to assess the safety benefits of its technology in the National Airspace System (NAS). The approach compared the rates of occurrence of relevant types of accidents before and

after the technology was introduced. The decrease was the measure of the contribution of the technology to improved safety in the NAS. This method has two major limitations. Firstly, it restricts the focus of analysis to accidents or symptoms rather than the related incidents or root causes that are precursors to aviation accidents. Thus, the agency loses the opportunity to evaluate technologies based on the entire system on which they have an effect. Secondly, the primary reliance on accident data, forces the technology evaluation and decision-making to be reactionary, as they depend on changes in the historical accident rates. Such an approach is of little use when deciding about investments in new, emerging technologies. A risk-based approach examines the set of incidents and processes in the system of NAS operations where aviation accidents occur. In this context, risk is defined as the product of the conditional probability of an accident (given a related set of incidents) and the severity or consequence of the accident measured in constant dollars. The probabilities are derived from annual data supplied by the NASA-Aviation Safety Reporting System (ASRS) and the National Transportation Safety Board (NTSB). These are modeled with a Poisson probability distribution. The consequences are derived from damage payments for aviation accidents derived from reports by the Department of Transportation and information on insurance claims paid. NASA's Synthetic Vision System (SVS) was used as a case study technology. It's effects on NAS operations related to commuter aircraft carriers were simulated using a Markov state-based model. The outputs of this modeling and simulation were the changes in the frequency and types of incidents and accidents as well as changes in the consequences of these accidents. Thus, the effect of synthetic vision on risk in the NAS could be determined as the difference between the risk computed prior to and following introduction of the technology. Sensitivity analysis is conducted to determine the variables with the greatest impact on risk and to set uncertainty bounds for the results. The method provides the agency with predictive power to evaluate emerging technologies for the NAS based on their expected impact on risk. Furthermore, it establishes a standard unit for risk measurements based on dollar value, which permits comparisons across technologies and across areas of operation in the NAS. The development of this risk-based approach to technology evaluation gives the Systems Analysis Branch an early start in complying with the requests of NASA Administrator, Dan Goldin, to incorporate probabilistic risk assessment as a tool to improve the safety performance of the agency.

Author

Assessments; Flight Safety; Risk; Safety Management; Research and Development

20000120597 Army Safety Center, Fort Rucker, AL USA

Flightfax: Army Aviation Risk-Management Information. Volume 28, Number 10

October 2000; 16p; In English

Report No.(s): AD-A383374; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flightfax is published by the U.S. Army Safety Center, Fort Rucker, AL 36362-5363. information is for accident-prevention purposes only and is specifically prohibited for use for punitive purposes or matters of liability litigation, or competition. This issue contains topics on the CH-47 helicopter, aviation accidents, fire safety, emergency training and other issues.

DTIC

Aircraft Accidents; Aircraft Safety; Fire Prevention; Risk; Management Information Systems

20000120860 Federal Aviation Administration, Washington, DC USA

Federal Aviation Administration National Aviation Research Plan

Feb. 2000; 221p; In English

Report No.(s): AD-A382052; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

Everyone takes a keen interest in what the FAA is doing-the Congress, industry, the media, the public ... that's because aviation touches our lives in so many ways. People rightly demand the safest, most reliable system possible. They expect the planes to be safe, their flights to be on time, and their luggage to be on the carousel. and they expect peak performance around the clock, day after day, year in, year out. The USA President, Congress, and the American public hold the Federal Aviation Administration responsible for providing a safe, secure, and efficient National Airspace System (NAS). Furthermore, they expect FAA actions and regulations to be effective in improving aviation safety and security while still mitigating the impacts of aircraft noise and emissions upon the environment. Better research and the implementation of effective new solutions increasingly hold the key to meeting the rising expectations of the American people and their Government. The significance of the FAA's research and development (R&D) will grow in proportion with the demands placed upon it. The FAA's R&D program finds and prepares to field technologies, systems, designs, and procedures that directly support the agency's principal operational and regulatory responsibilities: air traffic services, certification of aircraft and aviation personnel, operation and certification of airports, civil aviation security, and environmental standards for civil aviation. Safety remains the agency's top priority. While the FAA, NASA,

and other R&D sources have introduced many new technologies and procedures over the past 20 years-and the accident rate has dropped dramatically as a result expectations are constantly being raised.

DTIC

National Airspace System; Research and Development; Air Traffic; Aircraft Safety; Flight Safety; Civil Aviation; Management Planning

20000121138 Lockheed Martin Aeronautical Systems, Marietta, GA USA

Aviation Weather Information Communications Study (AWIN), Phase 1 and 2 Final Report

Ball, J. W., Lockheed Martin Aeronautical Systems, USA; Herron, R. G., Lockheed Martin Aeronautical Systems, USA; Nozawa, E. T., Lockheed Martin Aeronautical Systems, USA; Thomas, E. A., Aviation Concepts, Inc., USA; Withey, R. D., Aviation Concepts, Inc., USA; October 2000; 196p; In English

Contract(s)/Grant(s): N6601-97-C-8605; RTOP 577-40-20

Report No.(s): NASA/CR-2000-210469; E-12461; NAS 1.26:210469; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

This two part study examines the communication requirements to provide weather information in the cockpit as well as public and private communication systems available to address the requirements. Ongoing research projects combined with user needs for weather related information are used to identify and describe potential weather products that address decision support in three time frames: Far-Term Strategic, Near-Term Strategic and Tactical. Data requirements of these future products are identified and quantified. Communications systems and technologies available in the public as well as private sector are analyzed to identify potential solutions. Recommendations for further research identify cost, performance, and safety benefits to justify the investment. The study concludes that not all weather information has the same level of urgency to safety-of-flight and some information is more critical to one category of flight than another. Specific weather products need to be matched with communication systems with appropriate levels of reliability to support the criticality of the information. Available bandwidth for highly critical information should be preserved and dedicated to safety. Meanwhile, systems designed for in-flight-entertainment and other passenger/crew services could be used to support less critical information that is used only for planning and economic decision support.

Author

Cockpit Weather Information Systems; Aircraft Communication; Airborne Equipment; Weather; Flight Conditions; Aviation Meteorology

20000121146 Federal Aviation Administration, Aviation Security Research and Development Div., Atlantic City, NJ USA

Test and Evaluation Plan for the Laboratory Validation of X-ray Threat Image Projection

Monichetti, S. B.; Snyder, M. D.; Rubinstein, J.; May 2000; 18p; In English

Report No.(s): PB2000-108068; DOT/FAA/AR-00/43; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Threat Image Projection (TIP) system is an X-ray machine upgrade that projects fictional threats onto or in between the images of passenger baggage. TIP should increase screener vigilance and motivation, provide exposure to a wide range of threat images, and tracks screener performance. The Federal Aviation Administration's (FAA) Aviation Security Human Factors Program is involved in the deployment, test, evaluation of TIP at major airports in the USA. In the near future, the FAA will purchase and deploy TIP on more than 400 X-ray machines nationwide. The intent is to use these TIP-ready X-ray (TRX) machines to estimate compliance and enforcement (C&E) of FAA security standards. Voluminous narrative and field data support the validity of TIP for performance estimation, but definitive laboratory validation of the approach is necessary given enforcement actions. This project is an effort to test the validity of TIP by comparing screener performance with TIP images to their performance with real-world threats. The test shall determine if there are any screener performance differences between real threats, projected fictional threat images (FTIs), and projected combined threat images (CTIs).

NTIS

Human Factors Engineering; Threat Evaluation; Imaging Techniques; Airport Security

20000121160 Army Safety Center, Fort Rucker, AL USA

Flightfax: Army Aviation Risk-Management Information, Volume 23, No. 8

August 2000; 16p; In English

Report No.(s): AD-A380317; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Flightfax is published by the U.S. Army Safety Center, Fort Rucker, AL 36362-5363. information is for accident-prevention purposes only and is specifically prohibited for use for punitive purposes or matters of liability litigation, or competition. This periodical provides Army Aviation risk-management information.

DTIC

Aircraft Safety; Risk; Documents; Armed Forces

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control.

20000115492 Army Command and General Staff Coll., School of Advanced Military Studies, Fort Leavenworth, KS USA

Global Positioning System Selective Availability: Legal, Economic, and Moral Considerations

McGee, Jeffrey K.; Jan. 2000; 57p; In English

Report No.(s): AD-A381904; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Since World War II the USA has yielded many of its policy decisions to the desires of the USA military. These policy decisions reach from nylon and aluminum restrictions for the war efforts of World War II through the tough military build-up policies of the 1980s amidst fiscal constraints. In the aftermath of the conflict in Vietnam, President Ronald Reagan was determined to regain America's influence in the world by rebuilding the military and strengthening the economy. In 1989, the Berlin Wall came crashing down as the prelude to the fall of the Soviet Union and the Iron Curtain of communism. Without the apparent threat of war with the Soviet Union, the USA began to focus more on maintaining an economic and political leadership role around the world. No longer did the USA military hold a firm grip on the rudder of national policy. Instead, a balance between the amount of military power required to remain relevant in the world and economic and political influence was sought. One of the tools provided by the military to the civilian community is the Global Positioning System (GPS). This system, originally designed for the USA military, was released for public use in a degraded form after the tragic downing of a Korean airliner by Soviet fighter aircraft after the airliner unknowingly strayed into Soviet airspace in 1983. The GPS system's full accuracy capability was not released to the public out of fear by the Department of Defense (DOD) that potential adversaries might use the system for inertial guidance of smart munitions against the U.S.

DTIC

Policies; Economics; Availability; Global Positioning System; Ethics; Leadership

20000116522 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Display Booth Arrangement and Trifold Handout for Global Summit on International Aviation Infrastructure

Ciecka, Ronald; Jan. 2000; 13p; In English

Report No.(s): AD-A376032; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA engineers are launching missiles, Navy ships wait off-shore with anti-war missile weapons, weather forecasters watch approaching thunderstorms and send warnings to air-controllers, who re-route carriers to an offshore corridor. The day passes without incident. Military units finish their training exercises. Commander jets land safely and on schedule. The link that maintains the delicate balance to maintain safe uses of the nation's limited airspace is FACTS. The Fleet Area Control and Surveillance Facility (FACSFAC) Air Control Traffic System (FACTS) is a dual-redundant, real-time, state-of-the-art, digitized air traffic control and area surveillance system that combines signals from multiple radars and other sources and presents the data to air traffic controllers in color.

Author

Air Traffic Control; Real Time Operation; Radar; Air Traffic

20000116599 Naval Postgraduate School, Monterey, CA USA

The Experimental Evaluation of a DGPS Based Navigation System for the ARIES AUV

Stinespring, Benjamin M., Naval Postgraduate School, USA; June 2000; 202p; In English

Contract(s)/Grant(s): N00014-99-AF-00002

Report No.(s): AD-A380162; No Copyright; Avail: Defense Technical Information Center (DTIC)

Autonomous Underwater Vehicles (AUV) currently use varying methods for navigation, but incorporating GPS into those methods is becoming a popular technique. This thesis experimentally evaluates the configuration and implementation of the Navigational Suite within the Naval Postgraduate School's AUV, the ARIES (Acoustic Radio Interactive Exploratory Server).

Specific attention is given to the configuration of the vehicle's newly completed DGPS (Differential Global Positioning System). A brief discussion of DGPS and Extended Kalman Filter theory continues with a description of the make-up and applications of components within the Suite. Details of a series of experiments, which begins with evaluation of the DGPS setup, then qualifies the system in an open-water environment, and finally qualifies the DGPS in conjunction with newly configured ARIES Navigational Filter, provide an examination of the Suite's performance.

DTIC

Global Positioning System; Underwater Vehicles; Navigation; Autonomy

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology.

20000115471 Technische Univ., Div. of Control and Simulation, Delft, Netherlands

Angle-of-Attack Vane Calibration in Non-Stationary Flight. Flight Test Results for the 1998 Cessna Citation II Angle-of-Attack Vane Calibration

Soijer, M. W.; Aug. 1998; 30p; In English

Report No.(s): PB2000-106611; TUD/TM-856; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

August 26, 1998 a flight test was conducted by the Control and Simulation Division in Delft Aerospace, in order to recalibrate the angle-of-attack vane of the Cessna Citation II laboratory aircraft. In addition, the possibility of using non-stationary maneuvers rather than a series of stationary flight conditions was investigated. The proposed non-stationary calibration procedure reduces the time that is required for a full calibration test run from approximately forty minutes to less than ten minutes. This report contains both information on the flight test and the results from the calibration. It is shown that angle-of-attack vane calibration using a vertical gyro as a reference suffers from a hysteresis-like effect, where the use of an accelerometer along the longitudinal axis as a reference does not.

NTIS

Angle of Attack; Vanes; Aerodynamic Configurations

20000115608 NASA Langley Research Center, Hampton, VA USA

Exploratory Studies in Generalized Predictive Control for Active Aeroelastic Control of Tiltrotor Aircraft

Kvaternik, Raymond G., NASA Langley Research Center, USA; Juang, Jer-Nan, NASA Langley Research Center, USA; Bennett, Richard L., Bell Helicopter Co., USA; October 2000; 37p; In English; Active Controls Technology Conference, October 4-5, 2000, Bridgeport, CT, USA; Sponsored by Bell Helicopter Co., USA

Contract(s)/Grant(s): RTOP 581-10-11-03

Report No.(s): NASA/TM2000-210552; NAS 1.15:210552; L-18031; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Aeroelasticity Branch at NASA Langley Research Center has a long and substantive history of tiltrotor aeroelastic research. That research has included a broad range of experimental investigations in the Langley Transonic Dynamics Tunnel (TDT) using a variety of scale models and the development of essential analyses. Since 1994, the tiltrotor research program has been using a 1/5-scale, semispan aeroelastic model of the V-22 designed and built by Bell Helicopter Textron Inc. (BHTI) in 1981. That model has been refurbished to form a tiltrotor research testbed called the Wing and Rotor Aeroelastic Test System (WRATS) for use in the TDT. In collaboration with BHTI, studies under the current tiltrotor research program are focused on aeroelastic technology areas having the potential for enhancing the commercial and military viability of tiltrotor aircraft. Among the areas being addressed, considerable emphasis is being directed to the evaluation of modern adaptive multi-input multi-output (MIMO) control techniques for active stability augmentation and vibration control of tiltrotor aircraft. As part of this investigation, a predictive control technique known as Generalized Predictive Control (GPC) is being studied to assess its potential for actively controlling the swashplate of tiltrotor aircraft to enhance aeroelastic stability in both helicopter and airplane modes of flight. This paper summarizes the exploratory numerical and experimental studies that were conducted as part of that investigation.

Author

Control Systems Design; Active Control; Helicopters; Aeroelasticity; Aircraft Control

20000115905 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Airborne Icing Tanker Spray Array

Hane, Thomas; Oct. 26, 1999; 12p; In English

Report No.(s): AD-A376034; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contents include following: Air supply. Drag. Weight. Maintenance.

CASI

Design Analysis; User Requirements; Maintenance; Tanker Aircraft

20000116099 Federal Aviation Agency, Washington, DC USA

Airworthiness Certification of Aircraft and Related Products

Sep. 30, 1999; 270p; In English

Report No.(s): PB2000-103115; FAA-8130.2D; No Copyright; Avail: National Technical Information Service (NTIS)

This order establishes procedures for accomplishing original and recurrent airworthiness certification of aircraft and related products. The procedures contained in this order apply to both Manufacturing and Flight Standards Airworthiness Aviation Safety Inspectors and private persons or organizations delegated authority to issue airworthiness certificates and related approvals.

Author

Aircraft Reliability; Certification; Manufacturing; Organizations

20000116110 National Inst. of Standards and Technology, Building and Fire Research Lab., Gaithersburg, MD USA

New Approaches to the Development of Fire-Safe Materials

Morgan, Alexander B., National Inst. of Standards and Technology, USA; Gilman, Jeffrey W., National Inst. of Standards and Technology, USA; Nyden, Marc R., National Inst. of Standards and Technology, USA; Jackson, Catheryn L., National Inst. of Standards and Technology, USA; February 2000; 24p; In English

Report No.(s): PB2000-101949; NISTIR-6465; No Copyright; Avail: National Technical Information Service (NTIS)

Thermoplastic polyetherimide-clay nanocomposites were synthesized from 1,3-phenylenediamine and bisphenol A dianhydride using an in situ approach. Two types of organically treated clays were utilized to synthesize these nanocomposites. The two organically treated clays were montmorillonite clays treated with the ammonium salts of n-dodecylamine or 12-ammino-1-dodecanoic acid. The dispersion of the clay in the polyetherimide was analyzed by wide-angle X-ray scattering and transmission electron microscopy. The results showed that the clay treated with the ammonium salt of 12-amino-1-dodecanoic acid gave a well-dispersed intercalated nanocomposite while the clay treated with the ammonium salt of n-dodecylamine gave a well-dispersed immiscible blend. These nanocomposites were then analyzed by thermal gravimetric analysis for their thermal stability. Computation and experimental approaches were developed to explore the nature and consequences of thermally induced changes that occur in the condensed phase of burning polymers. A computational strategy for evaluating molecular weight distributions (which should enable us to calculate the melt viscosity during burning) from molecular dynamics simulations was developed based on a simple differential equation for the time dependence of the number average degree of polymerization, x , derived by Boyd. The experimental effort, which we hope to be able to use in validating the predictions of this model, was successful in obtaining real-time measurements of the mid-infrared spectra of burning polymers. The condensed phase spectra of nylon 6 and nylon 6/clay nanocomposite were measured using a fiber optic reflectance probe while they were burning on the cone calorimeter.

Author

Clays; Combustion; Molecular Dynamics; Real Time Operation; Mathematical Models; Temperature Effects; Thermal Stability; Thermal Analysis

20000116364 Institute for Environmental Safety and Occupational Risk Analysis, Risk Analysis Directorate, Brooks AFB, TX USA

Aircraft Corrosion Control: Assessment and Reduction of Chromate Exposures *Final Report, 1997-2000*

Carlton, Gary N.; England, Ellen E.; Jun. 2000; 52p; In English

Report No.(s): AD-A382245; IERA-RS-BR-TR-2000-0004; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The corrosion inhibitor of choice in the Air Force is hexavalent chromium (CrVI). CrVI is present in aircraft coating pretreatments as chromic acid and in primers as metallic chromates. Worker exposures to chromate compounds can occur during application of the pretreatment and primer. In addition, depainting (removal of old organic coatings) and mechanical sanding of existing coating systems can release particulates that contain chromates from previously-applied primers. These particulates can also present a CrVI exposure risk. Cr VII compounds have been linked to occupational diseases, specifically dermatitis, nasal irritation, and lung cancer. Water soluble CrVI compounds, such as chromic acid, are confirmed human carcinogens; metallic

chromates are considered either confirmed or suspected human carcinogens, depending on the specific metal attached to the chromate. Over the last three years, the industrial Hygiene Branch of the Air Force institute for Environment, Safety and Occupational Health Risk Analysis (AFIERA) collaborated with the Air Force Structural Maintenance community to identify improved methods to reduce CrVI exposures during corrosion control procedures. We completed a series of field evaluations at Shaw, Cannon, Holloman, Nellis, Hill, Robins, Tinker, and McChord AFBs, and a chromate reduction study at Shaw and Cannon. This technical report summarizes our recommended sampling methodology, data interpretation, and chromate reduction techniques to reduce chromate exposures.

DTIC

Corrosion Prevention; Chromates; Chemical Analysis

20000116373 Air Univ., Center for Aerospace Doctrine Research and Education, Maxwell AFB, AL USA
Uninhabited Combat Aerial Vehicles: Airpower by the People, For the People, But Not With the People
Clark, Richard M.; Aug. 2000; 100p; In English
Report No.(s): AD-A382577; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

In one form or another, unmanned aerial vehicles (UAV) have been employed for over 2,000 years. Lt Col Richard M. Clark's Uninhabited Combat Aerial Vehicles: Airpower by the People, For the People, But Not With the People, draws on that long history to gauge what the future may hold for uninhabited combat aerial vehicles (UCAV). The USA (US) Air Force's experience with UCAVs dates back to World War I and the US Army Air Service's order for 25 Kettering Bugs, explosive-laden unmanned minibiplanes. Over the next 60 years, the Air Force continued to experiment with and periodically employ UAVs/UCAVs in peace and war. Operational results were decidedly mixed. The Air Force abandoned UCAV development in the aftermath of the Vietnam War, but by the 1990s there was a marked resurgence of interest in UCAVs as a means of doing more with less while reducing combat risks to pilots. Given the problematic history of UAVs/UCAVs, knowledge of past experience could prove beneficial to the current generation of UCAV developers and planners. To that end, Colonel Clark examines technological obstacles that have handicapped UCAVs historically and which could continue to impede their future evolution. He then turns to more contemporary organizational and cultural issues that might hinder integration of UCAVs into the force. Clark concludes his study by proposing answers to two fundamental questions: (1) What are the major obstacles to UCAVs achieving meaningful operational status in the Air Force, and (2) Can those obstacles be overcome?

DTIC

Pilotless Aircraft; Drone Aircraft; Design Analysis

20000117680 NASA Langley Research Center, Hampton, VA USA
Aerospace Systems Design in NASA's Collaborative Engineering Environment
Monell, Donald W., NASA Langley Research Center, USA; Piland, William M., NASA Langley Research Center, USA; Acta Astronautica; 2000; ISSN 0094-5765; Volume 47, Nos. 2-9, pp. 255-264; In English; Copyright; Avail: Issuing Activity

Past designs of complex aerospace systems involved an environment consisting of collocated design teams with project managers, technical discipline experts, and other experts (e.g., manufacturing and systems operation). These experts were generally qualified only on the basis of past design experience and typically had access to a limited set of integrated analysis tools. These environments provided less than desirable design fidelity, often lead to the inability of assessing critical programmatic and technical issues (e.g., cost, risk, technical impacts), and generally derived a design that was not necessarily optimized across the entire system. The continually changing, modern aerospace industry demands systems design processes that involve the best talent available (no matter where it resides) and access to the the best design and analysis tools. A solution to these demands involves a design environment referred to as collaborative engineering. The collaborative engineering environment evolving within the National Aeronautics and Space Administration (NASA) is a capability that enables the Agency's engineering infrastructure to interact and use the best state-of-the-art tools and data across organizational boundaries. Using collaborative engineering, the collocated team is replaced with an interactive team structure where the team members are geographical distributed and the best engineering talent can be applied to the design effort regardless of physical location. In addition, a more efficient, higher quality design product is delivered by bringing together the best engineering talent with more up-to-date design and analysis tools. These tools are focused on interactive, multidisciplinary design and analysis with emphasis on the complete life cycle of the system, and they include nontraditional, integrated tools for life cycle cost estimation and risk assessment. NASA has made substantial progress during the last two years in developing a collaborative engineering environment. NASA is planning to use this collaborative engineering infrastructure to provide better aerospace systems life cycle design and analysis, which includes analytical assessment of the technical and programmatic aspects of a system from "cradle to grave." This paper describes

the recent NASA developments in the area of collaborative engineering, the benefits (realized and anticipated) of using the developed capability, and the long-term plans for implementing this capability across Agency.

Author

Aerospace Systems; Control Systems Design; Complex Systems; Systems Analysis

20000119051 NASA Ames Research Center, Moffett Field, CA USA

Future Directions in Rotorcraft Technology at Ames Research Center

Aiken, Edwin W., NASA Ames Research Center, USA; Ormiston, Robert A, Army Aviation and Missile Command, USA; Young, Larry A., NASA Ames Research Center, USA; [2000]; 1p; In English; 56th, 2-4 May 2000, Virginia Beach, VA, USA; Sponsored by American Helicopter Society, Inc., USA; No Copyright; Avail: Issuing Activity; Abstract Only

Members of the NASA and Army rotorcraft research community at Ames Research Center have developed a vision for 'Vertical Flight 2025'. This paper describes the development of that vision and the steps being taken to implement it. In an effort to realize the vision, consistent with both NASA and Army Aviation strategic plans, two specific technology development projects have been identified: (1) one focused on a personal transportation system capable of vertical flight (the 'Roto-Mobile') and (2) the other on small autonomous rotorcraft (which is inclusive of vehicles which range in grams of gross weight for 'MicroRotorcraft' to thousands of kilograms for rotorcraft uninhabited aerial vehicles). The paper provides a status report on these projects as well as a summary of other revolutionary research thrusts being planned and executed at Ames Research Center.

Author

Research and Development; Transportation; Vertical Flight; Rotary Wing Aircraft; Technology Feasibility Spacecraft

20000119080 General Accounting Office, General Government Div., Washington, DC USA

Border Patrol Procurement of MD 600N Helicopters Should Be Reassessed

Sep. 2000; 49p; In English

Report No.(s): AD-A383115; GAO/GGD-00-201; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The INS procurement in which the MD 600N helicopter was selected for the Border Patrol was intended to provide an aircraft capable of meeting a variety of air operations requirements, such as low and slow surveillance and transport of agents and mission equipment. To obtain such a multipurpose aircraft, the contract solicitation listed three minimum performance criteria the aircraft needed to have. The aircraft was required to operate at a speed of up to 130 knots, operate at high altitude with crew and equipment outlined by the statement of work, and be capable of operating at least 2 hours under normal conditions. The aircraft was also required to have seating for two pilots and two passengers. Only two aircraft were determined to be within the competitive range under these specifications.

DTIC

Helicopters; Government Procurement; Equipment Specifications

20000119924 Dassault Aviation, Saint-Cloud, France

Supportability in Design and low Life Cycle Cost (LCC) : the MIRAGE 2000 Example *Supportabilite en Conception et Faible Cout Global: L'Exemple du MIRAGE 2000*

Lemaigen, Louis, Dassault Aviation, France; Huet, Franck, Dassault Aviation, France; Rajabaly, Maleck, Dassault Aviation, France; Design for Low Cost Operation and Support; September 2000, pp. 6-1 - 6-7; In English; See also 20000119918; Copyright Waived; Avail: CASI; A02, Hardcopy

Though not fully designed, as later the RAFALE was, through a true Integrated Logistic Support (ILS) methodology, the MIRAGE 2000 received, during its design phases, a strong involvement of the future Users and took benefit of Dassault Aviation's experience and operational feedback from previous programs to give it the "abilities" of a highly available and maintainable aircraft. The overall approach of "Supportability in Design" is presented and the way the "capabilities" have been incorporated in the A/C definition and its evolution are highlighted. The major technical choices and their "Supportability" aspects are presented. The field-demonstrated Support characteristics show how the objectives have been met. For a given design, different logistic solutions are possible, depending on the specific Customer and the size of his fleet, to reduce the Life Cycle Cost (LCC) without impairing the operational use of the fleet. Such an optimisation, using an LCC tool, is presented.

Author

Low Cost; Cost Reduction; Life Cycle Costs; Cost Effectiveness; Cost Analysis; Design to Cost

20000119926 Aerospatiale Matra Airbus, Toulouse, France

Aircraft Design to Operational Cost

Gosselin, Stephane, Aerospatiale Matra Airbus, France; Design for Low Cost Operation and Support; September 2000, pp. 9-1

- 9-12; In English; See also 20000119918; Copyright Waived; Avail: CASI; A03, Hardcopy

The method that will be presented to you is used on Airbus products. The aim of this presentation is to give you an overview and some indications on the process and the associated tools that we have developed to ensure that the design of our products is coherent with the operators expectations in term of operational costs. The presentation will first show the evolution of the market and of the operators expectations that drove the emergence of the Integrated Logistic Support concept. This will be followed by a description of how we have adapted this concept in a very pragmatic procedure applicable to military transport as well as commercial aircraft design. The five steps of the procedure will then be detailed. An overview of the existing tools and of the environment in which this procedure is applied will follow.

Derived from text

Aircraft Design; European Airbus; Design to Cost; Operating Costs; Production Costs; Cost Analysis; Life Cycle Costs

20000119927 DaimlerChrysler Aerospace A.G., Military Aircraft Div., Munich, Germany

Requirements, Design Features and Manufacturing Techniques Leading to Reduced Operational Cost for Advanced Military Airframe Structures

Voglsinger, M., DaimlerChrysler Aerospace A.G., Germany; Mennle, E., DaimlerChrysler Aerospace A.G., Germany; Blas, G., DaimlerChrysler Aerospace A.G., Germany; Design for Low Cost Operation and Support; September 2000, pp. 10-1 - 10-11; In English; See also 20000119918; Copyright Waived; Avail: CASI; A03, Hardcopy

Reliability has a key role to play in successful deployment of the Eurofighter/Typhoon, because its air force customers are relying on improved availability rates, and therefore buying fewer aircraft than would previously have been required. A set of M, R + T-requirements derived from previous in-service-aircraft-programs has been established, amended by new technology potentials and airforce customers demands. Selected design criteria, design features and manufacturing techniques supporting the goal of reduced operational cost are detailed below.

Derived from text

Cost Reduction; Operating Costs; Cost Analysis

20000119932 British Aerospace Public Ltd. Co., Military Aircraft and Aerostructures, Warton, UK

The Ultra Reliable Aircraft

Bottomley, Ted, British Aerospace Public Ltd. Co., UK; Design for Low Cost Operation and Support; September 2000, pp. 14bis-1 - 14bis-4; In English; See also 20000119918; Copyright Waived; Avail: CASI; A01, Hardcopy

Rather than a flying aircraft, the Ultra Reliable Aircraft (URA) is a research project which aims to enable substantial increases in aircraft operational availability and reliability. Customers, both civil and military, now expect reduced costs with improved satisfaction and UK industry must take action to meet these new challenges. In response, the Society of British Aerospace Companies (SBAC) through their Foresight Action program, initiated the Ultra Reliable Aircraft program. This program has, as its ultimate objective, the elimination of all unscheduled aircraft maintenance. However, at the current rate of design and development effort, and in terms of reliability, attempts to dramatically increase the in-service reliability of systems and equipment are providing diminishing returns. Even when new technology and increased complexity are taken into account, what is needed is a step change in reliability performance to break the trend and realise the levels of reliability required to respond to the new challenges.

Author

Aircraft Reliability; Research and Development; Operations Research

20000120385 NASA Glenn Research Center, Cleveland, OH USA

Flying Qualities Evaluation of a Commuter Aircraft With an Ice Contaminated Tailplane

Ranaudo, Richard J., Bombardier Aerospace, USA; Ratvasky, Thomas P., NASA Glenn Research Center, USA; FossVanZante, Judith, DYNACS Engineering Co., Inc., USA; September 2000; 14p; In English; General Aviation Technology Conference and Exposition (GATC), 9-11 May 2000, Wichita, KS, USA; Sponsored by Society of Automotive Engineers, Inc., USA

Contract(s)/Grant(s): RTOP 548-21-23

Report No.(s): NASA/TM-2000-210356; E-12405; SAE-2000-01-1676; NAS 1.15:210356; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the NASA/FAA (Federal Aviation Administration) Tailplane Icing Program, pilot evaluations of aircraft flying qualities were conducted with various ice shapes attached to the horizontal tailplane of the NASA Twin Otter Icing Research Aircraft. Initially, only NASA pilots conducted these evaluations, assessing the differences in longitudinal flight characteristics between the baseline or clean aircraft, and the aircraft configured with an Ice Contaminated Tailplane (ICT). Longitudinal tests included Constant Airspeed Flap Transitions, Constant Airspeed Thrust Transitions, zero-G Pushovers, Repeat Elevator

Doublets, and Simulated Approach and Go-Around tasks. Later in the program, guest pilots from government and industry were invited to fly the NASA Twin Otter configured with a single full-span artificial ice shape attached to the leading edge of the horizontal tailplane. This shape represented ice formed due to a 'Failed Boot' condition, and was generated from tests in the Glenn Icing Research Tunnel on a full-scale tailplane model. Guest pilots performed longitudinal handling tests, similar to those conducted by the NASA pilots, to evaluate the ICT condition. In general, all pilots agreed that longitudinal flying qualities were degraded as flaps were lowered, and further degraded at high thrust settings. Repeat elevator doublets demonstrated reduced pitch damping effects due to ICT, which is a characteristic that results in degraded flying qualities. Pilots identified elevator control force reversals (CFR) in zero-G pushovers at a 20 deg flap setting, a characteristic that fails the FAR 25 no CFR certification requirement. However, when the same pilots used the Cooper-Harper rating scale to perform a simulated approach and go-around task at the 20 deg flap setting, they rated the airplane as having Level I and Level II flying qualities respectively. By comparison, the same task conducted at the 30 deg flap setting, resulted in Level II flying qualities for the approach portion, and Level III for the go-around portion. The results of this program indicate that safe and acceptable flying qualities with an ICT condition, can be effectively assessed by task-oriented pilot maneuvers. In addition, other maneuvers such as repeat elevator doublets provide good qualitative and quantitative assessments of pitch damping and elevator effectiveness, which are characteristics that correlate well with pilot task ratings. The results of this testing indicate that the FAR 25 zero-G pushover maneuver, which requires no CFR during its execution, may be an overly conservative pass/fail criteria for aircraft certification.

Author

Aircraft Performance; Ice; Ice Formation; Commuter Aircraft; Flight Characteristics

20000120602 Naval Postgraduate School, Monterey, CA USA

Dynamic Exploration of Helicopter Reconnaissance Through Agent-Based Modeling

Unrath, Craig S.; September 2000; 132p; In English

Report No.(s): AD-A383393; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This thesis uses Multi-Agent System modeling to develop a simulation of tactical helicopter performance while conducting armed reconnaissance. It focuses on creating a model to support planning for the Test and Evaluation phase of the Comanche helicopter acquisition cycle. The model serves as an initial simulation laboratory for scenario planning, requirements forecasting, and platform comparison analyses. The model implements adaptive tactical movement with agent sensory and weaponry system characteristics. Agents are able to determine their movement direction and paths based on their perceived environment, attributes, and movement personalities. The model incorporates a three-dimensional aspect to properly simulate aerial reconnaissance. An integrated Graphical User Interface enables the user to create environments, instantiate agent propensities and attributes, set simulation parameters, and analyze statistical output. The resulting model demonstrates the ability to represent helicopter reconnaissance behavior. It captures simulation summary statistics that illustrate enemy performance, helicopter performance, and logistical requirements. The model establishes an initial simulation tool to further explore Comanche operational requirements and planning for its Test and Evaluation phase.

DTIC

Aerial Reconnaissance; Helicopters; Aircraft Models

20000120605 Army Aeromedical Research Lab., Fort Rucker, AL USA

Noise Levels in the USAARL NUH-60 (Black Hawk) Aeromed Flight Simulator *Final Report*

Gordon, Elmaree; Ahroon, William A.; August 2000; 15p; In English

Report No.(s): AD-A383436; USAARL-2000-19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Noise levels in the NUH-60 (Black Hawk) Aeromed Flight Simulator located at the U.S. Army Aeromedical Research Laboratory were measured. Noise levels were adjusted using a nine-position control set by the simulator operator. The simulator operator's manual stated that noise levels should not exceed 85 dBA. Measurements were made at five noise level settings at the pilot and copilot stations. Results showed that the A-weighted sound level of the flight simulator at Noise Level Setting 1 was 81.8 dBA while levels at Settings 3, 5, 7, and 9 exceeded the 85 dBA noise exposure limit. In addition, the octave-band frequency spectrum of the simulator noise at Setting 9 differed appreciably from the spectrum of an actual UH-60A aircraft. These differences were particularly large (exceeding 20 dB) in the upper frequencies in the speech range and should be considered before similar research involving communication or speech intelligibility is conducted. It is noted that noise hazard signs are posted appropriately at the entrance to the USAARL NUH-60 flight simulator in accordance with MIL-STD-1474D "Noise Limits". Hearing protective devices should be used in the simulator when operated at noise levels above the lowest noise level setting.

DTIC

Aircraft Noise; Noise Intensity; Helicopters; Flight Simulators

20000121191 APS Aviation, Inc., Quebec, Ontario Canada

Hot Water Deicing of Aircraft *Final Report*

Dawson, Peter, APS Aviation, Inc., Canada; Hanna, Medhat, APS Aviation, Inc., Canada; Aug. 2000; 79p; In English
Report No.(s): AD-A383453; DOT/FAA/AR-00/40; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A research program was undertaken to further examine environmental limits for the application of hot water as the first-step fluid in a two-step deicing procedure. Results from several previous related studies were used to determine an approach to current testing and as sources of related data. Tests on flat plates were conducted at the National Research Council Canada (NRC), Climatic Engineering Facility (CEF) in Ottawa. Test parameters included temperature, wind, active precipitation (type and rate), and substrate material. (Standard test plates were fabricated from typical aircraft composite materials as well as from aircraft aluminum.) A controlled level of contamination was allowed to collect on the plates prior to each test run by exposing the plate to precipitation for a predetermined time interval. The resulting layer of ice contamination was then removed by spraying as much fluid as was required to produce a clean plate. Fluids tested included water, diluted Society of Automotive Engineers (SAE) Type I fluid, and full strength SAE Type I fluid. The most critical data measured in these trials were the time intervals between fluid application (spray) and first appearance of ice on test surfaces. An interval of at least 3 minutes was the key indicator of acceptable temperature and wind limits. Laboratory testing has shown that at a precipitation rate of 25 gm/sq cm/hr, hot water provides a period of protection equal to or better than Type I mixed to the approved buffer (-3 deg C) at outside air temperature (OAT) down to -6 deg C and wind speeds to 10 kph. A Type I premix provided about the same period of protection at the same test conditions (2 to 3 minutes). Increasing the level of surface contamination has no significant effect on fluid performance since increased quantities of hot water are required to deice, which negates the effect of increased contamination.

DTIC

Deicing; Ice; Aircraft Icing; Ice Prevention; Flight Safety; Water

20000121192 American Inst. of Aeronautics and Astronautics, Reston, VA USA

Support of AIAA Student Aircraft Design/Build/Fly Competition *Final Report, 1 Oct. 1999-30 Sep. 2000*

Page, Gregory S., American Inst. of Aeronautics and Astronautics, USA; Bovias, Chris, American Inst. of Aeronautics and Astronautics, USA; Selig, Michael, American Inst. of Aeronautics and Astronautics, USA; Sep. 30, 2000; 1546p; In English
Contract(s)/Grant(s): N00014-98-1-0493

Report No.(s): AD-A383509; Rept-2000DBF7630; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

This report is made up of the combined reports of 28 separate teams of students who entered the 2000 Design, Build & Fly Competition. The objectives of the Design, Build & Fly Competition were to have students teams design, build and fly unmanned remote control electric aircraft designed for two specific missions: a short-field cargo sortie and a cruise/ferry sortie. A "fly-off" took place on the Cessna Aircraft Field near Wichita, KS in April 2000. Winners of the contest: 1st place, Utah State University; 2nd place, Oklahoma State University; 3rd place, University of Illinois. The Design, Build & Fly Competition was supported by Cessna, the Office of Naval Research and the AIAA Foundation.

DTIC

Aircraft Design; Cessna Aircraft; Fly by Wire Control; Pilotless Aircraft

20000121226 NASA Ames Research Center, Moffett Field, CA USA

Experimental Analysis of Mast Lifting and Bending Forces on Vibration Patterns Before and After Pinion Reinstallation in an OH-58 Transmission Test Rig

Huff, Edward M., NASA Ames Research Center, USA; Lewicki, David G., Army Research Lab., USA; Tumer, Irem Y., Caelum Research Corp., USA; Decker, Harry, Army Research Lab., USA; Barszez, Eric, NASA Ames Research Center, USA; Zakrajsek, James J., NASA Glenn Research Center, USA; [2000]; 12p; In English; 56th, 2-4 May 2000, Virginia Beach, VA, USA; Sponsored by American Helicopter Society, Inc., USA

Contract(s)/Grant(s): NAS2-14217; Copyright; Avail: Issuing Activity

As part of a collaborative research program between NASA Ames Research Center (ARC), NASA Glenn Research Center (GRC), and the US Army Laboratory, a series of experiments is being performed in GRC's 500 HP OH-58 Transmission Test Rig facility and ARC's AH-1 Cobra and OH-58c helicopters. The findings reported in this paper were drawn from Phase-I of a two-phase test-rig experiment, and are focused on the vibration response of an undamaged pinion gear operating in the transmission test rig. to simulate actual flight conditions, the transmission system was run at three torque levels, as well as two mast lifting and two mast bending levels. The test rig was also subjected to disassembly and reassembly of the main pinion housing to simulate the effect of maintenance operations. An analysis of variance based on the total power of the spectral distribution indicates the relative effect of each experimental factor, including Wong interactions with torque. Reinstallation of the main pinion assembly is shown to introduce changes in the vibration signature, suggesting the possibility of a strong effect of maintenance

on HUMS design and use. Based on these results, further research will be conducted to compare these vibration responses with actual OH58c helicopter transmission vibration patterns.

Author

Helicopter Performance; Analysis of Variance; Vibration; Experimentation

20000121351 Naval Surface Warfare Center, Dahlgren, VA USA

Effect of Trajectory Shaping on Observability of NTW Interceptor In-Flight Alignment Errors

Ohlmeyer, Ernest J., Naval Surface Warfare Center, USA; Pepitone, Thomas R., Aerospace Technology, Inc., USA; Hanger, David B., Naval Surface Warfare Center, USA; 1999; 11p; In English

Report No.(s): AD-A381219; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Navigation system and in-flight alignment requirements for a Navy Theater Wide (NTW) tactical ballistic missile interceptor are discussed. The missile navigation system is externally aided with both GPS and radar data for dynamic alignment and calibration of the missile's navigation system during flight. System alignment errors arise from missile in-canister initialization, ship navigation errors, and ship radar face misalignments. Reduction of these errors during flight is critical so that the rather small field-of-view of the Kinetic Warhead (KW) seeker can acquire and divert successfully to the target. The extent to which attitude errors are removed depends on the accuracy of the measurements, the kinematic activity in the trajectory, and the degree of observability associated with the state error dynamics. An observability metric is developed and used to quantify a measure of error state observability and evaluate the potential benefits afforded by intentional trajectory shaping. Several trajectory shaping techniques including nominal and aggressive launch azimuth biases, vertical plane shaping, and sinusoidal lateral plane maneuvers are investigated. Handover alignment accuracy is determined throughout the tactical engagement envelope and compared to NTW system requirements. The study also quantifies the value added of combining GPS and radar aiding data for in-flight alignment versus the use of radar alone.

DTIC

Missile Trajectories; Calibrating; Interceptors; Missile Systems; Navigation; Ballistic Missiles; Alignment

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

20000115866 California Univ., Irvine, CA USA

Mixing of an Airblast-Atomized Fuel Spray Injected Into a Crossflow of Air

Leong, May Y., California Univ., USA; McDonell, Vincent G., California Univ., USA; Samuelsen, G. Scott, California Univ., USA; October 2000; 386p; In English

Contract(s)/Grant(s): NCC3-412; RTOP 714-02-20

Report No.(s): NASA/CR-2000-210467; E-12463; NAS 1.26:210467; UCI-ARTR-00-05; No Copyright; Avail: CASI; A17, Hardcopy; A04, Microfiche

The injection of a spray of fuel droplets into a crossflow of air provides a means of rapidly mixing liquid fuel and air for combustion applications. Injecting the liquid as a spray reduces the mixing length needed to accommodate liquid breakup, while the transverse injection of the spray into the air stream takes advantage of the dynamic mixing induced by the jet-crossflow interaction. The structure of the spray, formed from a model plain-jet airblast atomizer, is investigated in order to determine and understand the factors leading to its dispersion. To attain this goal, the problem is divided into the following tasks which involve: (1) developing planar imaging techniques that visualize fuel and air distributions in the spray, (2) characterizing the airblast spray without a crossflow, and (3) characterizing the airblast spray upon injection into a crossflow. Geometric and operating conditions are varied in order to affect the atomization, penetration, and dispersion of the spray into the crossflow. The airblast spray is first characterized, using imaging techniques, as it issues into a quiescent environment. The spray breakup modes are classified in a liquid Reynolds number versus airblast Weber number regime chart. This work focuses on sprays formed by the "prompt" atomization mode, which induces a well-atomized and well-dispersed spray, and which also produces a two-lobed liquid distribution corresponding to the atomizing air passageways in the injector. The characterization of the spray jet injected into the crossflow reveals the different processes that control its dispersion. Correlations that describe the inner and outer boundaries of the spray jet are developed, using the definition of a two-phase momentum-flux ratio. Cross-sections of the liquid spray depict elliptically-shaped distributions, with the exception of the finely-atomized sprays which show kidney-shaped distributions reminiscent of those obtained in gaseous jet in crossflow systems. A droplet trajectory analysis overpredicts the liquid mass

penetration, and indicates a need for a more rigorous model to account for the three-dimensional mixing field induced by the jet-crossflow interaction. Nonetheless, the general procedures and criteria that are outlined can be used to efficiently assess and compare the quality of sprays formed under different conditions.

Author

Air Flow; Atomizing; Cross Flow; Fuel Sprays; Gas Injection; Mixing Length Flow Theory

20000118268 Prins Maurits Lab. TNO, Rijswijk, Netherlands

Occupational Health Risks of Exhaust Gases of the Apache During FARP Operational *Final Report Arbeidshygiënische Risico's Door apache-Uitlaatgassen Tijdens FARP-Oefeningen*

Groeneveld, F. F., Prins Maurits Lab. TNO, Netherlands; February 2000; 19p; In Dutch

Contract(s)/Grant(s): A99/KLu/498; TNO Proj. 014.11655

Report No.(s): TD99-0421; PML-1999-A105; Copyright; Avail: Issuing Activity

During the FARP operation with the Apache helicopter the most important components from the exhaust of the Apache engines were measured by personal en stationary sampling downwind of the helicopter. The measured concentrations were far below the MAC-values.

Author

Health; Risk; Exhaust Gases; Helicopters

20000119928 General Electric Co., Aircraft Engines, Cincinnati, OH USA

JSF F120 Engine Program. Low Cost Operation and Support: An Engine Manufacturer's Perspective

Murphy, K., General Electric Co., USA; Smith, J., General Electric Co., USA; Wensits, D., Allison Advanced Development Co., USA; Design for Low Cost Operation and Support; September 2000, pp. 11-1 - 11-4; In English; See also 20000119918; Copyright

Waived; Avail: CASI; A01, Hardcopy

The JSF F120 engine is being developed specifically to meet the overall affordability objectives of the JSF Program, addressing all elements of cost from development through operation and support. Uniquely different from current systems, the JSF affordability focus is driving fundamental changes in the engine configuration and development, acquisition, and support processes to facilitate meeting these overall affordability goals. Although these changes influence all aspects of the F120 engine design, one of the critical elements to meeting these objectives is improving the supportability characteristics of engine. Improved supportability, implemented through increased reliability, improved safety, reduced maintenance, and flexible support systems, will result in lower overall operation and support costs over the life of the weapon system. These improvements will facilitate the affordable operation of the F120-based propulsion system. To meet the desired supportability improvements, the F120 engine is being designed as an inherently more robust, lower variation system based on the Team's Six Sigma initiatives to positively impact maintenance and support costs yielding lower total cost of ownership for our customers. The F120 engine design process is focused on configuration simplicity, full 3D simulation, advanced diagnostics, and support system flexibility to achieve the desired cost benefit. The F120 engine's simplicity, with significantly fewer parts than current engine systems, provides the basis for improved reliability and lower cost. Each of these parts is being designed in a full 3D Visualization and modeling environment to permit full assessment of maintenance and support needs during the design process. Overall, the engine will utilize an advanced Prognostics and Health Management (PHM) system, combined with the weapon system's Integrated Flight Propulsion Control (IFPC), Vehicle Management System (VMS) and advanced information processing systems, to provide specific data on the health of the engine to facilitate "oncondition" maintenance and support. Combined with the engine's PHM system is the ability to provide a flexible customer support system to facilitate the operation and support needs of the weapon system's various customers. This flexibility permits easy adaptability to both today's and future systems capitalizing on different partnerships between government and industry. Integrating these focused activities will permit the GE/AADC/RR Team to provide an F120 engine system that optimizes the balance between reliability, maintainability, and support resources to deliver a low cost, maintenance friendly system ultimately meeting affordability objectives.

Author

Low Cost; Operating Costs; Cost Reduction; Cost Analysis; Design to Cost; Life Cycle Costs

20000119929 Rolls-Royce Ltd., Bristol, UK

Implications of 'Power by the Hour' on Turbine Blade Lifing

Bagnall, S. M., Rolls-Royce Ltd., UK; Shaw, D. L., Rolls-Royce Ltd., UK; Mason-Flucke, J. C., Rolls-Royce Ltd., UK; Design for Low Cost Operation and Support; September 2000, pp. 12-1 - 12-10; In English; See also 20000119918; Copyright Waived;

Avail: CASI; A02, Hardcopy

'Power by the Hour' engine sales contracts are becoming popular both amongst engine operators and engine manufacturers. This paper examines how accurate turbine blade life prediction is achieved and is combined with accurate measurement of damage in service for successful contract fulfillment.

Derived from text

Turbine Blades; Engine Parts; Life (Durability); Predictions

20000120213 NASA Glenn Research Center, Cleveland, OH USA

Numerical Propulsion System Simulation (NPSS) 1999 Industry Review

Lytle, John, NASA Glenn Research Center, USA; Follen, Greg, NASA Glenn Research Center, USA; Naiman, Cynthia, NASA Glenn Research Center, USA; Evans, Austin, NASA Glenn Research Center, USA; August 2000; 96p; In English, 6-7 Oct. 1999, Cleveland, OH, USA

Contract(s)/Grant(s): RTOP 509-10-11

Report No.(s): NASA/TM-2000-209795; E-12085; NAS 1.15:209795; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The technologies necessary to enable detailed numerical simulations of complete propulsion systems are being developed at the NASA Glenn Research Center in cooperation with industry, academia, and other government agencies. Large scale, detailed simulations will be of great value to the nation because they eliminate some of the costly testing required to develop and certify advanced propulsion systems. In addition, time and cost savings will be achieved by enabling design details to be evaluated early in the development process before a commitment is made to a specific design. This concept is called the Numerical Propulsion System Simulation (NPSS). NPSS consists of three main elements: (1) engineering models that enable multidisciplinary analysis of large subsystems and systems at various levels of detail, (2) a simulation environment that maximizes designer productivity, and (3) a cost-effective, high-performance computing platform. A fundamental requirement of the concept is that the simulations must be capable of overnight execution on easily accessible computing platforms. This will greatly facilitate the use of large-scale simulations in a design environment. This paper describes the current status of the NPSS with specific emphasis on the progress made over the past year on air breathing propulsion applications. In addition, the paper contains a summary of the feedback received from industry partners in the development effort and the actions taken over the past year to respond to that feedback. The NPSS development was supported in FY99 by the High Performance Computing and Communications Program.

Author

Numerical Analysis; Simulation; Propulsion System Configurations; Technology Utilization; Research and Development

20000120290 NASA Glenn Research Center, Cleveland, OH USA

A Probabilistic Approach to Aeropropulsion System Assessment

Tong, Michael T., NASA Glenn Research Center, USA; July 2000; 14p; In English; 45th; International Gas Turbine and Aeroengine Technical Congress, 8-11 May 2000, Munich, Germany; Sponsored by American Society of Mechanical Engineers, USA

Contract(s)/Grant(s): RTOP 714-99-20

Report No.(s): NASA/TM-2000-210334; E-12036-1; NAS 1.15:210334; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A probabilistic approach is described for aeropropulsion system assessment. To demonstrate this approach, the technical performance of a wave rotor-enhanced gas turbine engine (i.e. engine net thrust, specific fuel consumption, and engine weight) is assessed. The assessment accounts for the uncertainties in component efficiencies/flows and mechanical design variables, using probability distributions. The results are presented in the form of cumulative distribution functions (CDFs) and sensitivity analyses, and are compared with those from the traditional deterministic approach. The comparison shows that the probabilistic approach provides a more realistic and systematic way to assess an aeropropulsion system.

Author

Aircraft Engines; Design Analysis; Gas Turbine Engines

20000120395 NASA Glenn Research Center, Cleveland, OH USA

Unsteady Analysis of Inlet-Compressor Acoustic Interactions Using Coupled 3-D and 1-D CFD Codes

Suresh, A., DYNACS Engineering Co., Inc., USA; Cole, G. L., NASA Glenn Research Center, USA; September 2000; 22p; In English

Contract(s)/Grant(s): RTOP 509-10-11

Report No.(s): NASA/TM-2000-210247; E-12367; NAS 1.15:210247; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is well known that the dynamic response of a mixed compression supersonic inlet is very sensitive to the boundary condition imposed at the subsonic exit (engine face) of the inlet. In previous work, a 3-D computational fluid dynamics (CFD) inlet code (NPARC) was coupled at the engine face to a 3-D turbomachinery code (ADPAC) simulating an isolated rotor and the coupled simulation used to study the unsteady response of the inlet. The main problem with this approach is that the high fidelity turbomachinery simulation becomes prohibitively expensive as more stages are included in the simulation. In this paper, an alternative approach is explored, wherein the inlet code is coupled to a lesser fidelity 1-D transient compressor code (DYNTECC) which simulates the whole compressor. The specific application chosen for this evaluation is the collapsing bump experiment performed at the University of Cincinnati, wherein reflections of a large-amplitude acoustic pulse from a compressor were measured. The metrics for comparison are the pulse strength (time integral of the pulse amplitude) and wave form (shape). When the compressor is modeled by stage characteristics the computed strength is about ten percent greater than that for the experiment, but the wave shapes are in poor agreement. An alternate approach that uses a fixed rise in duct total pressure and temperature (so-called 'lossy' duct) to simulate a compressor gives good pulse shapes but the strength is about 30 percent low.

Author

Computational Fluid Dynamics; Simulation; Experiment Design; Supersonic Inlets; Dynamic Response

20000120591 NASA Lewis Research Center, Cleveland, OH USA

Investigation of Methods for the Structural Weight Analysis of a Mach 2.4 Axisymmetric Inlet

Nadell, Shari-Beth, NASA Lewis Research Center, USA; August 1994; 36p; In English

Contract(s)/Grant(s): RTOP 505-69-50

Report No.(s): NASA-TM-106693; E-9048; NAS 1.15:106693; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Structural design and analysis tools appropriate for estimating the structural weight of an axisymmetric inlet designed for Mach 2.4 cruise were evaluated. Little information regarding the inlet mechanical design is available in the preliminary design phase, so it is necessary to first develop a reasonable structural design before estimating the inlet weight. The Internally Pressurized Structure Synthesis and Optimization (IPSSO) program, employing an analytical approach, was chosen for evaluation due to its combined design and analysis capabilities. The inlet design produced by IPSSO was then analyzed using the NASTRAN finite element program. The finite element analysis was performed to help identify the limitations of the analytically based code as well as to evaluate NASTRAN for this application. Comparison between the IPSSO inlet weight and that of a similar inlet developed by the Boeing Commercial Airplane Group was also made. Program evaluation concluded that the combined use of IPSSO to create an initial design and NASTRAN to perform a numerical analysis would provide the capability to evaluate a limited number of inlet design. The development of a new tool for the minimum weight design and analysis of inlet structures would be required for greater flexibility in evaluating inlet conceptual designs.

Author

Structural Analysis; Structural Design; Structural Weight; Weight Analysis; Supersonic Inlets; Engine Design

20000121217 NASA Glenn Research Center, Cleveland, OH USA

Recommendations for Achieving Accurate Numerical Simulation of Tip Clearance Flows in Transonic Compressor Rotors

VanZante, Dale E., NASA Glenn Research Center, USA; Strazisar, Anthony J., NASA Glenn Research Center, USA; Wood, Jerry R., NASA Glenn Research Center, USA; Hathaway, Michael D., Army Research Lab., USA; Okiishi, Theodore H., Iowa State Univ. of Science and Technology, USA; September 2000; 26p; In English; International Gas Turbine Institute Exposition, 7-10 Jul. 1999, Indianapolis, IN, USA; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 523-26-33

Report No.(s): NASA/TM-2000-210347; E-12395; NAS 1.15:210347; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The tip clearance flows of transonic compressor rotors are important because they have a significant impact on rotor and stage performance. While numerical simulations of these flows are quite sophisticated, they are seldom verified through rigorous comparisons of numerical and measured data because these kinds of measurements are rare in the detail necessary to be useful in high-speed machines. In this paper we compare measured tip clearance flow details (e.g. trajectory and radial extent) with corresponding data obtained from a numerical simulation. Recommendations for achieving accurate numerical simulation of tip clearance flows are presented based on this comparison. Laser Doppler Velocimeter (LDV) measurements acquired in a transonic compressor rotor, NASA Rotor 35, are used. The tip clearance flow field of this transonic rotor was simulated using a Navier-Stokes turbomachinery solver that incorporates an advanced k-epsilon turbulence model derived for flows that are not in local equilibrium. Comparison between measured and simulated results indicates that simulation accuracy is primarily dependent

upon the ability of the numerical code to resolve important details of a wall-bounded shear layer formed by the relative motion between the over-tip leakage flow and the shroud wall. A simple method is presented for determining the strength of this shear layer.

Author

Blade Tips; Airfoil Profiles; Clearances; Transonic Compressors; Turbocompressors; Compressor Rotors; Rotor Blades (Turbomachinery); Stator Blades

20000121248 Syracuse Univ., Dept. of Mechanical and Aerospace Engineering, NY USA

Unsteady Heat Transfer on the Turbine Research Facility at Wright Labs Final Report, 1 Jul. 1994 - 30 Sep. 1998

LaGraff, John E.; Jun. 2000; 4p; In English

Contract(s)/Grant(s): F49620-94-1-0269

Report No.(s): AD-A382261; AFRL-SR-BL-TR-00-0472; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Steady-state and time resolved heat transfer rates were measured on a first stage vane of a modern high pressure aircraft turbine. The tests were conducted in the blow-down (transient) Turbine Research Facility (TRF) at the USAF Wright Laboratories in Dayton, Ohio. The heat transfer instrumentation was designed, fabricated, and installed on the test vane at the Oxford University Osney Turbomachinery Laboratory. Tests were conducted in the TRF with an array of instrumental blades in addition to the present test blade allowing comparisons to be made with steady and unsteady measurements, aerodynamic data, and other techniques to measure heat transfer. Ultimately, comparisons with prediction techniques were made. Full technical results have been reported in the literature (Refs. 1, 2).

DTIC

Heat Transfer; Unsteady Aerodynamics; Turbulent Heat Transfer

20000121253 NASA Glenn Research Center, Cleveland, OH USA

Load Capacity Estimation of Foil Air Journal Bearings for Oil-Free Turbomachinery Applications

DellaCorte, Christopher, NASA Glenn Research Center, USA; Valco, Mark J., Army Research Lab., USA; October 2000; 22p; In English; International Joint Tribology, 1-4 Oct. 2000, Seattle, WA, USA; Sponsored by Society of Tribologists and Lubrication Engineers, USA

Contract(s)/Grant(s): RTOP 523-18-13

Report No.(s): NASA/TM-2000-209782; E-12067; ARL-TR-2334; NAS 1.15:209782; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper introduces a simple "Rule of Thumb" (ROT) method to estimate the load capacity of foil air journal bearings, which are self-acting compliant-surface hydrodynamic bearings being considered for Oil-Free turbo-machinery applications such as gas turbine engines. The ROT is based on first principles and data available in the literature and it relates bearing load capacity to the bearing size and speed through an empirically based load capacity coefficient, D. It is shown that load capacity is a linear function of bearing surface velocity and bearing projected area. Furthermore, it was found that the load capacity coefficient, D, is related to the design features of the bearing compliant members and operating conditions (speed and ambient temperature). Early bearing designs with basic or "first generation" compliant support elements have relatively low load capacity. More advanced bearings, in which the compliance of the support structure is tailored, have load capacities up to five times those of simpler designs. The ROT enables simplified load capacity estimation for foil air journal bearings and can guide development of new Oil-Free turbomachinery systems.

Author

Loads (Forces); Estimating; Foil Bearings; Turbomachinery

20000121255 NASA Glenn Research Center, Cleveland, OH USA

Optical Measurement and Visualization in High-Pressure, High-Temperature, Aviation Gas Turbine Combustors

Hicks, Yolanda R., NASA Glenn Research Center, USA; Anderson, Robert C., NASA Glenn Research Center, USA; Locke, Randy J., DYNACS Engineering Co., Inc., USA; September 2000; 18p; In English; EOS/SPIE Symposium on Applied Photonics, 22-25 May 2000, Glasgow, Scotland, UK; Sponsored by International Society for Optical Engineering, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 714-02-40

Report No.(s): NASA/TM-2000-210377; E-12431; NAS 1.15:210377; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Planar laser-induced fluorescence (PLIF), planar Mie scattering (PMie), and linear (1-D) spontaneous Raman scattering are applied to flame tube and sector combustors that burn Jet-A fuel at a range of inlet temperatures and pressures that simulate

conditions expected in future high-performance civilian gas turbine engines. Chemiluminescence arising from C₂ in the flame was also imaged. Flame spectral emissions measurements were obtained using a scanning spectrometer. Several different advanced concept fuel injectors were examined. First-ever PLIF and chemiluminescence data are presented from the 60-atm Gas turbine combustor facility.

Author

Chemiluminescence; Laser Induced Fluorescence; Mie Scattering; Optical Measurement; Combustion Chambers; Jet Engine Fuels; Flames

08

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots.

20000116403 NASA Langley Research Center, Hampton, VA USA

Real-Time Parameter Estimation in the Frequency Domain

Morelli, Eugene A., NASA Langley Research Center, USA; Journal of Guidance, Control and Dynamics; September - October 2000; Volume 23, No. 5, pp. 812-818; In English; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

A method for real-time estimation of parameters in a linear dynamic state-space model was developed and studied. The application is aircraft dynamic model parameter estimation from measured data in flight. Equation error in the frequency domain was used with a recursive Fourier transform for the real-time data analysis. Linear and nonlinear simulation examples and flight test data from the F-18 High Alpha Research Vehicle were used to demonstrate that the technique produces accurate model parameter estimates with appropriate error bounds. Parameter estimates converged in less than one cycle of the dominant dynamic mode, using no a priori information, with control surface inputs measured in flight during ordinary piloted maneuvers. The real-time parameter estimation method has low computational requirements and could be implemented

Author

Estimating; Fourier Transformation; Frequency Domain Analysis; Real Time Operation; Simulation

20000119076 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA

Intelligent Flight Control of Uninhabited Aerial Vehicles Final Report, 1 Jun 1997-30 May 2000

Bernstein, Dennis S.; May 30, 2000; 10p; In English

Contract(s)/Grant(s): F49620-97-1-0406

Report No.(s): AD-A382981; AFRL-SR-BL-TR-00-0477; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this project was to develop, implement, and demonstrate intelligence flight control technology. During the previous two reporting periods, construction of the flight test vehicle was completed and flight tests were conducted validating various aircraft systems. Theoretical research under this grant focused on developing identification methods that were suitable for on-line implementation.

DTIC

Flight Control; Flight Tests; Intelligence; On-Line Systems; Unmanned Spacecraft; Control Theory

20000120075 Old Dominion Univ., Aerospace Engineering Dept., Norfolk, VA USA

Finite Element Modeling of Synthetic Jet Actuators

Ro, Jeng-Jong, Old Dominion Univ., USA; 2000 NASA-HU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; September 2000, pp. 72; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Interest in active flow control for aerospace applications such as wing flutter and tail buffeting has stimulated the recent development of innovative actuator designs that create localized disturbances in a flowfield. A novel class of devices, known as synthetic jet actuator, has been demonstrated to exhibit promising flow control capabilities including separation control and thrust vectoring. The basic components of a synthetic jet actuator are a cavity and oscillating materials. The synthetic jet actuator developed at NASA LaRC has a small housing in which a cylindrical cavity was enclosed by two metal diaphragms, 50 mm in diameter, placed opposite each other. A piezoelectric wafer was attached to the center of the outside face of each metal diaphragm. The pair of piezoelectric metal diaphragms was operated with a 180 deg phase differential at the same sinusoidal voltage and frequency. With actuation, a synthetic jet issued from a 35.5 mm long by 0.5 mm wide slot on the top of device. In this study, a finite element model of the synthetic jet actuator tested at NASA LaRC is developed. The developed finite element model can be utilized to design and determine the performance of the synthetic jet actuator. The analysis is separated into two sections. The

first section investigates the finite element model of the circular piezoelectric wafer. The nonconforming triangular plate element with three nodes per element is utilized to study the electric-structural coupling associated with the metal diaphragm and the input actuating voltage of lead zirconate titanate (PZT). The optimal geometry of PZT is found based on the maximum volumetric deflection of the circular piezoelectric wafer. The second section discusses the finite element modeling of the piezoelectric wafers with the fluid cavity system. The characteristics of the structural-fluid coupled system are investigated. The phase-average jet center velocity and amplitude of the input voltage of PZT are predicted by this finite element model. The theoretical prediction is compared to experimental results obtained at NASA LaRC.

Author

Actuators; Finite Element Method; Piezoelectricity; Mathematical Models; Wafers; Research and Development

20000120601 Naval Postgraduate School, Monterey, CA USA

Exploration of Fibre Channel as an Avionics Interconnect for the 21st Century Military Aircraft

Hendricks, Shawn P.; September 2000; 193p; In English

Report No.(s): AD-A383392; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Avionics architectures are evolving from "Federated" systems consisting of highly specialized black boxes connected together via MIL-STD-1553 and ARINC 429 data buses to "Integrated" and "Distributed" architectures. These new architectures contain high data-rate sensors, parallel processors, and shared memory with high levels of integration. These systems require a new interconnection system that overcomes the limitations of older standards. One such interconnection system is Fibre Channel. This thesis evaluates Fibre Channel as avionics interconnection standard. It begins by defining the requirements and measures of performance for an interconnection system suitable for the new avionics architectures. The requirements address technical performance, affordability, reliability, sustainability, and maintainability considerations. The Fibre Channel standards are then compared to the requirements for the avionics interconnection system. In order to perform a technical performance evaluation of a switched fabric avionics interconnection system, a computer simulation model was developed. The OPNET Modeler% tool from OPNET, Inc. was used to model the components of an advanced avionics system. The results of this simulation demonstrated that Fibre Channel meets all the performance requirements of an avionics interconnect.

DTIC

Avionics; Aircraft Equipment; Flight Recorders; Electronic Equipment

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems.

20000116133 NASA Goddard Space Flight Center, Greenbelt, MD USA

High-Speed Automated Tester for Vacuum Chamber Feedthrough Connectors and Cables

Swope, Robert H., NSI Technology Services Corp., USA; [2000]; 1p; In English; 21st, Space Sim. Conference, 25 Oct. 2000, Annapolis, MD, USA

Contract(s)/Grant(s): NAS5-32537; No Copyright; Avail: Issuing Activity; Abstract Only

The Goddard Space Flight Center's thermal vacuum laboratory has developed a high-speed automated system for testing the integrity of 37-pin MIL-C-5015 cylindrical electrical feedthrough connectors used on penetration plates of thermal vacuum chambers. The system consists of a desktop PC driving a data acquisition front end. The latter measures the resistance through each pin of the connector and the resistance from each pin to all other pins and the connector shell. In addition to identifying unacceptable feedthroughs, the system is also used for testing cables. In the special case of Type T thermocouples (used almost exclusively at the lab), the difference in resistance between the copper and constantan wires provides positive proof of accidentally reversed connector wiring. Data acquisition time to completely test a cable or feedthrough connector is less than thirty seconds. The system provides a hardcopy printout of the resistance readings. Connectors or cables with fewer wires are tested using simple adapter cables. Initial tests indicate that the performance of a given feedthrough connector can be predicted on the basis of measured resistance readings, reducing ongoing cost of connector replacement. The opportunity to positively certify the integrity of cables, cable connectors and feedthroughs before the start of a thermal vacuum test minimizes the likelihood of a circuit problem that would require returning the chamber to ambient conditions for repair. This system has two principal advantages for the Goddard thermal vacuum laboratory. Its only significant cost was the labor to fabricate the test cable and shorting cable -- about

40 man-hours total. The system was built around a computer and data acquisition unit that were already on hand. The second advantage is that it very quickly tests both of the parameters that are essential.

Author

Connectors; Data Acquisition; Electric Connectors; High Speed; Vacuum Chambers

20000120141 NASA Langley Research Center, Hampton, VA USA

Improvements to Progressive Wave Tube Performance Through Closed-Loop Control

Rizzi, Stephen A., NASA Langley Research Center, USA; October 2000; 55p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 522-63-11-03

Report No.(s): NASA/TM-2000-210623; L-18040; NAS 1.15:210623; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents recent improvements to the acoustic and thermal control systems of the Thermal Acoustic Fatigue Apparatus (TAFE), a progressive wave tube test facility at the NASA Langley Research Center, Hampton, Virginia. A brief summary of past acoustic performance is given first to serve as a basis for comparison with the new performance data using a multiple-input, closed-loop, narrow-band controller. Performance data in the form of test section acoustic power spectral densities and coherence are presented in three of six facility configurations for a variety of input spectra. Tested spectra include uniform, two cases of pink noise, three cases of narrow-band random, a simulated launch payload bay environment for an expendable launch vehicle, and a simulated external acoustic load for the aft section of a reusable launch vehicle. In addition, a new closed-loop temperature controller and thermocouple data acquisition system are described.

Author

Performance Tests; Test Chambers; Test Facilities; Research and Development; Experimentation; Research Facilities

20000120216 Royal Aeronautical Society, London, UK

Flight Simulation: A Decade of Regulatory Change: Proceedings

[2000]; 98p; In English; Flight Simulation: A Decade of Regulatory Change, 8-9 Nov. 2000, London, UK; See also 20000120217 through 20000120227; ISBN 1-85768-112-6; Copyright; Avail: Issuing Activity

This document represents the proceedings of a conference about flight simulators, and the environment which regulates the training devices used in pilot and flight crew training.

CASI

Conferences; Flight Simulators; Pilot Training; Regulations

20000120217 Thomson Training and Simulation Ltd., Gatwick, UK

Use of Predicted Data for Simulator Qualification of a Fly-By-Wire Aeroplane

Bateman, Ian D., Thomson Training and Simulation Ltd., UK; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 1.1 - 1.7; In English; See also 20000120216; Copyright; Avail: Issuing Activity

The growing use and continued evolution of Electronic Flight Control "Fly-By-Wire (FBW)" systems in aircraft presents many ever-increasing challenges to simulator manufacturers, operators and regulatory authorities alike. Every evolution of the FBW system has the potential to modify the aeroplane's handling characteristics and consequently every modification carries the possibility of invalidating some or all of the data used in the simulator Qualification Test Guide (QTG). This presents unwelcome hurdles during initial and recurrent approvals as operators and manufacturers maintain training devices to be representative of the fleet. It is not practical or economically possible for the aircraft manufacturer to collect new flight test data for every evolutionary modification of the flight control system. As a consequence this has led to an increase in 'the use of predicted data derived from engineering simulators and iron bird test rigs such as those used to certify the FBW systems for actual aeroplane certification. A limited rationale defining the acceptability of such data to regulatory authorities was initially defined some years ago. However the gradual evolution of the electronic flight control systems is now leading to an increase in the amount of such data being provided by the aircraft manufacturer for use in the QTG. Without updated regulations or guidelines to follow the industry today is constantly re-evaluating the quantity and quality of predicted data used to qualify a training device on a case by case basis. In some instances the lack of common understanding by regulators, aircraft and simulator manufacturers has led to excessive amounts of predicted data, supported by numerous rationales and additional tests, being used in simulator qualification test guides. This paper, from the simulator manufacturers viewpoint, will present some tentative criteria that may be used to determine when the use of engineering simulator data in place of, or in preference to, flight test data might be considered

appropriate. It also proposes that it is now time for the industry to revalidate its guidelines governing the use of iron bird or engineering simulator generated data in Qualification Test Guides.

Author

Fly by Wire Control; Qualifications; Training Devices; Aircraft Control; Flight Simulators

20000120218 Federal Aviation Administration, National Simulator Program, Atlanta, GA USA

The Significance of a Qualitative Handling Assessment Approach Towards Motion System Requirements for Flight Simulators

Lahiri, Arnab, Federal Aviation Administration, USA; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 2.1 - 2.5; In English; See also 20000120216; Copyright; Avail: Issuing Activity

Progress drives regulation and regulation drives progress. The aircraft simulator is a classic example where one aspect is constantly trying to push the other to be a step ahead. The full flight simulator consists of various engineered sub-systems, the merits for their inclusion having stood the test of time with their contribution towards the training value of the simulation. Motion is one such sub-system for which opinions can be greatly divided. However, a vast majority of the current high fidelity simulators use motion to enhance the fidelity of their simulation. In fact, to achieve certain levels of training capabilities, a simulator must have motion- the regulations demand it. The compatibility between the requirements of the standards by which they are bound and the progress in technology and reliability that has been accomplished often does not justify the means. Wherever possible, the process of evaluation is carried out with a combination of qualitative and subjective approach. Quantifying an assessment facilitates the interpretation of the value judgment assigned to the level of simulation. The ultimate goal in this business of airplane simulation- which include the manufacturer, the regulator and the training entity, is really the quality of training imparted to the pilot. The individual goal of each sub-system of the simulation then should be to drive and complement each other in order to achieve that ultimate training aid. Any method of attaching degrees of objectivity to the quality of the motion system should therefore be a better assessment than just checking performance in isolation or at extremities where normal simulation rarely go. This paper attempts to sort out the facts behind the existing nature of the current requirements for commercial simulators and the aspects which are considered to be of importance to a motion-based simulator. The nature of regulations and motion are discussed and suggestions are proposed on how the motion system could be regulated for enhanced fidelity rather than just mechanical performance capability.

Author

Flight Simulators; Motion Simulators; Simulation; Flight Training

20000120219 CTC Aviation Group Public Ltd. Co., ATP Academy, Southampton, UK

Introducing a JAR Flight Training Device into Flight Training

Carver, T., CTC Aviation Group Public Ltd. Co., UK; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 6.1 - 6.5; In English; See also 20000120216; Copyright; Avail: Issuing Activity

CTC Aviation Group in association with Mechtronix Systems of Canada presented probably the first combined JAR-STD 2 and 3 FTD 2/FNPT II device for Qualification. The machine was awarded its Qualification on 5th September 2000, and achieved a good standard for the UK CAA. The B737-300 FTD 2/FNPT II standard precisely meets the needs of CTC at its ATP Academy site by providing the means of simulation for half of its B737 Type Conversion Course, and all advanced jet generic training for Airline Bridge and Foundation Courses and associated MCC modules. Instructor and Examiner training, Command Training and Pilot Selection in general are all possible on this device, which is conveniently situated close to the Academy for rapid groundschool consolidation and continuity into the flight phase. Development of this cost effective trainer requires a great deal of input from the customer as well as the supplier, and in order to benefit from the easements of data collection permitted under JAR for this type of device, resources have to be applied to it. For example CTC mounted a B737 aircraft flight test lasting three hours to enable data to be collected by stopwatch and video to supplement, confirm and amend the flight package. To satisfy regulatory requirements regarding systems fidelity, Mechtronix used Boeing Level Four data, whilst the flight package was derived from a geometric model with specific performance points derived from flight test or Flight Manual. The greatest effort required occurred at the hardware and software integration stage, with the greatest difficulties being encountered in areas of auto-flight and FMS/FMC. VNAV was undoubtedly the most difficult of all subjects to integrate. The regulators have provided our industry with the opportunity that we sought to develop more cost effective simulation. It is now our turn to show that we can produce an efficacious product within the new rules which are an improvement. We should now just get on with it because I believe that we have little excuse.

Author

Flight Training; Pilot Selection; Training Devices; Training Simulators

20000120220 Thomson Training and Simulation Ltd., Clergy Pontoise, France

A Case Study of the Introducing of an Flight Navigation and Procedure Trainer (FNPT) into Helicopter Flight Training
Erismann, Jean-Francois, Thomson Training and Simulation Ltd., France; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 7.1 - 7.5; In English; See also 20000120216; Copyright; Avail: Issuing Activity

European Joint Aviation Authorities (JAA) have established the use of specific training devices for ab-initio training. The regulations have been prepared by JAR-STD and JAR-FCL working groups. Aeroplane regulations are already enforced and helicopter regulation is following the same process. The French DGAC, the French Army Aviation, Proteus Helicopteres- a French ab-initio training school and Thomson Training & Simulation in France have joined their efforts to validate the basic principles and ensure the best adaptation of regulation to intended training. The paper presents the device used and the experimentation conducted.

Author

Flight Training; Helicopters; Training Devices

20000120221 Grouperment Francais de l'Helicoptere, France

A Bright Future for FNPT Helicopter Pilot Training. New Possibilities in the Field of Helicopter Training (JAR STD 1 H and 3 H) and Introduction of FNPT in Operation and Licensing Regulations (JAR OPS 3 and JAR FCL 2)

Schmitt, Charles, Grouperment Francais de l'Helicoptere, France; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 9.1 - 9.2; In English; See also 20000120216; Copyright; Avail: Issuing Activity

The quality achieved by simulation today is such that helicopter training can be well improved in the near future but we have to define : (1) a good qualification standard for the equipment, (2) an adequate time credit level in order to obtain a pilot licence in line with the STD possibilities, (3) the possible use in regards of JAR OPS 3 Subpart N requirements in terms of recent experience and recurrent training. We still have a large amount of work to achieve but if done properly, we may not only help the helicopter industry to improve its safety level but also help to avoid excessive training costs. In order to achieve this goal, a close co-operation between the JAA working groups dealing with JAR STD 1 H and 3 H, JAR FCL 2 and JAR OPS 3 is paramount.

Author

Helicopters; Pilot Training; Qualifications; Simulation; Flight Simulators

20000120222 SimConsult Ltd., Hilversum, Netherlands

Regulation and Innovation: A Contradiction in Terms?

Teunissen, Raymond P. A. M., SimConsult Ltd., Netherlands; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 10.1 - 10.7; In English; See also 20000120216; Copyright; Avail: Issuing Activity

Pilot training has changed tremendously over the past fifty years. The most visible example of this change is of course the full flight simulator A training tool, developed in that period from almost non-existing to the present, state of the art, zero flight time training machine. Regulations, and particularly licensing regulations, however, are today basically very similar to what they were at the time they were agreed upon: The mid 1940's. In their current format international and national licensing regulations are essentially inventories of knowledge, skill and experience requirements. They lack any reference to training objectives or performance criteria, with an exception perhaps to the current JAR-FCL, where a cautious first step has been taken in this direction. Essentially this means that all over the world pilot training is performed under regulations that prescribe the kind of training (classroom-, aircraft- etc.), the duration of this type of training ("x" number of days, so many flying hours), the training means to be used (aircraft, with some possible exceptions for a simulator) and the experience to be gained before a certain license, rating or privilege is granted. Especially the air transport industry in Europe feels more and more constrained by these regulations. Only limited use can be made of modern technologies and methodologies. Ab-initio airline pilot training will be discussed in the further chapters to illustrate the main idea: That current regulations limit the much needed innovation of pilot training.

Author

Flight Simulators; Pilot Training; Regulations; Licensing

20000120223 Scandinavian Airlines System, Flight Academy, Stockholm, Sweden

A Report on the Progress (or Lack thereof) in International Reciprocal Recognition of Simulator Qualifications

Reed-Mohn, Erik, Scandinavian Airlines System, Sweden; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 11.1 - 11.5; In English; See also 20000120216; Copyright; Avail: Issuing Activity

The RAeS initiated the process of standardizing the international regulations governing the qualifications of flight simulators in 1989. It has been clearly understood and anticipated that the authorities supported by industry, would follow the establishing of a single set of regulations with a system of mutual recognition, in order to eliminate the countless unnecessary qualifications performed to the same standards, by a host of different authorities. We have now been working on this for more than eight years

since the ICAO manual was approved, and the progress has been rather slow. It is in fact so slow, that willful neglect is probably closer to the truth. The US FAA NSP today has a Simulator Implementation Procedure (SIP) with only two members of the JAA; the UK and Switzerland. This year two more may be added and the goal is for two more in 2001. If that happens, the process will have yielded 0.6 countries a year at the end of ten years. Within the JAA the progress has been much better with by far the majority of simulators already being covered by mutual recognition, if not the majority of JAA nations. The paper will examine the possible reasons for the slow progress in the USJAA area, and propose a possible way forward.

Author

Flight Simulators; International Cooperation; Qualifications; Pilot Training

20000120224 Federal Aviation Administration, National Simulator Program, Atlanta, GA USA

Flight Simulator Standards: A Case for Review, Revalidation and Modernisation

Ray, Paul A., Federal Aviation Administration, USA; *Flight Simulation: A Decade of Regulatory Change: Proceedings*; [2000], pp. 12.1 - 12.11; In English; See also 20000120216; Copyright; Avail: Issuing Activity

Over ten years ago, airlines, training centers, simulator manufacturers and regulatory authorities joined together in an attempt to resolve the issue of varying simulator standards promulgated by independent national regulatory authorities. Results of that effort, accomplished under the auspices of the Royal Aeronautical Society (RAeS), was the January 1992 adoption and subsequent publication of International Standards for the Qualification of Airplane Flight Simulators. The original RAeS standard was subsequently incorporated into an International Civil Aviation Organization (ICAO) document, Manual of Criteria for the Qualification of Flight Simulators, first published in 1994. The document prescribes standards for the two highest levels of flight simulators, Levels I and II and is- recognized throughout the simulation community as the accepted standard for flight simulators as evidenced by incorporation of the ICAO standards into the Joint Aviation Authorities JAR-STD IA. The overwhelming majority of time and effort devoted to the development of International Standards for the Qualification of Airplane Flight Simulators addressed Qualification Test Guide data issues. Although a sub working group began work on motion standards, the essence of standards for motion, visual and sound were derived from Federal Aviation Administration Advisory Circular 120-40B. The author proposes a review of current international flight simulator standards. The need for review, revalidation, and modernization as appropriate, is clear when it is realized that current motion, visual and sound standards are, in large part, over 20 years old. The author presents several examples as starting points for discussion of revised standards. Examples include the incorporation of well defined processes for the use of engineering data in lieu of flight test data, a case for modernizing sound requirements and associated testing, comprehensive motion standards, and proposals for more accurate visual systems and displays.

Author

Flight Simulators; Training Simulators; Standards; Regulations; Training Devices

20000120225 MB Consultants, Deal, UK

Common Simulator Qualification Standards: Frustrating or Funny?

Blackwood, Malcolm I., MB Consultants, UK; *Flight Simulation: A Decade of Regulatory Change: Proceedings*; [2000], pp. 13.1 - 13.6; In English; See also 20000120216; Copyright; Avail: Issuing Activity

Ten years ago the RAeS-sponsored Working Group on International Standards was in full swing, holding meetings in both Europe and North America designed to bring together the then disparate technical requirements into a single coherent standard for use worldwide. There was great ceremony made when the document was complete, along with much industry encouragement and an optimistic view that the foundation had been laid for a decreased burden of evaluations on a significant number of simulators around the globe. Now, at the turn of the new century, have we actually progressed, or has the whole industry merely sunk itself into a quicksand of meeting ever more onerous requirements for what can only be at the very least questionable (some would say negligible) increase in training fidelity? The International Standards still specifies, with a small number of exceptions, an excellent set of criteria for the technical qualification of a full flight simulator, yet additions, embellishments and interpretations that have been gradually accumulating over the past decade are placing burdens on all parts of the industry that many feel make compliance with the latest standards disproportionate to the benefits it brings. This gives very little incentive for simulator operators to comply with these standards. Coupled with that is the increasing - not decreasing - burden on many simulator operators in terms of authority evaluations. It seems that many regulatory authorities who formerly showed little interest in performing simulator evaluations now are determined to make their mark. These and many other factors discourage operators - and even entire countries - from 'swearing their allegiance' to a system they feel would over-burden them with responsibility and extra unnecessary work. Whilst new devices can be built relatively easily to comply, most operators are afraid to upgrade their slightly older devices lest they be told that the upgraded version will not meet the (interpreted) standards. We live, supposedly, in an age of reason, where discussion and communication are touted as being the answers to the world's problems. The flight simulator

industry has for many years been at the forefront of cross-party communications that are heralded as second-to-none, but there is a deepening disquiet within the industry that is leading some to frustration and others to mirth at the loss of perception as to what we are all trying to achieve. Nobody with any experience in the industry wants to take for granted the gains that have been made hitherto, but it is surely time to take stock and look harder at the overall picture before we all get bogged down in the petty finer details and the associated paperwork. I accept that time will eventually play its own part in enforcing the technical standards across the board, but there are some very old simulators out there, and how long can we wait? What this paper will attempt to do is to outline these frustrations from a reasonably non-partisan point of view, and also suggest some possible solutions. These will primarily be aimed at the technical arena, addressing particularly the items that create much frustration but which are ill-defined and therefore open to extreme interpretation, but it is to be hoped that a greater degree of understanding of the requirements will develop that will aid co-operation in the highly-charged political arena as well.

Derived from text

Flight Simulators; Qualifications; Pilot Training; Standards

20000120226 Joint Aviation Authorities, Licensing Div., Hoofddorp, Netherlands

The Use of Synthetic Training Devices in JAR-FCL Training

Ribeiro, Luis Cardoso, Joint Aviation Authorities, Netherlands; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 15.1 - 15.6; In English; See also 20000120216; Copyright; Avail: Issuing Activity

Joint Aviation Requirements for Flight Crew Licensing (JAR-FCL) have been developed for all categories of pilot licences so as to permit use of licences and ratings without further formality in any of the participating States. JAR-FCL describes the use of a STD for training, testing and checking of a pilot. In other words it identifies which device may be used for a certain exercise. This paper gives an overview of the credits in JAR-FCL given for the following training purposes (1) Private and Professional Pilot Licences (2) Instrument Ratings (3) Type Ratings (4) Zero Flight Time Training (5) Multi-Crew Co-operation (MCC) Training (6) Instructor Ratings/Authorisations. It also emphasises that for the technical qualification of a synthetic training device one of the applicable documents of the JAR-STD family shall be used, and for the user approval JAR-FCL is the applicable standard.

Author

Qualifications; Flight Simulators; In-Flight Simulation; Education

20000120227 Flight Safety Boeing Training International, USA

A Decade of Regulatory Change

Hoit, Ed, Flight Safety Boeing Training International, USA; Flight Simulation: A Decade of Regulatory Change: Proceedings; [2000], pp. 17.1 - 17.4; In English; See also 20000120216; Copyright; Avail: Issuing Activity

Presentation reviews the progress made in flight simulation. Along side the development of flight simulators there was progress made in regulation of the simulators. It also reviews the development of international training of flight crews, and the resultant regulatory requirements.

Author

Education; Flight Simulators; International Cooperation; Regulations

20000120258 Institute for Human Factors TNO, Soesterberg, Netherlands

Effects of Low-Cost Components on the Validity of a High-End Driving Simulator *Interim Report Effecten Van Low-Cost Componenten op de Validiteit Van Een Rijsimulator*

Sluimer, R. R., Institute for Human Factors TNO, Netherlands; Korteling, J. E., Institute for Human Factors TNO, Netherlands; May 12, 2000; 31p; In English

Contract(s)/Grant(s): A98/KL/301; TNO Proj. 790.3

Report No.(s): TD-2000-0137; TNO-TM-00-A028; Copyright; Avail: Issuing Activity

Currently driving training simulators are not frequently used due to their high cost compared to the cost of traditional driving lessons. The cost drivers of high-end driving simulators must be replaced by affordable components in order to obtain cost-effective training. These cost drivers are, among other things, the visual image generation system and the moving base. This study was executed in order to determine if training effectiveness of a truck driving simulator would be maintained when expensive components were replaced by low-cost components. These components were: 1. A seat-shaker instead of a full 6 degrees of freedom moving base. 2. A head slaved display instead of a fully functional display. 3. Head slaved mirrors instead of fully functional mirrors. It was found that the head-slaved display and the head-slaved mirrors did not hamper training effectiveness. The situation was different for the seat-shaker. It was found that this apparatus did not resemble the motion cues of a real truck. This might affect training effectiveness. However, it is known that the amount of training investment (i.e. time) needed for learning to execute those subtasks that are sensitive to motion cues is rather low. Hence, most driving tasks can still

be trained on a simulator in which no motion system is implemented. The major conclusions from this study are: 1. For the average driving task in which motion cues are not critical a seat shaker as the only motion system will do for driver training. When motion cues are critical for learning to execute a specific task, a high-end motion system should be implemented. 2. Low-cost head slaved mirrors do not hamper training effectiveness and consequently are an excellent substitute for a high end mirror configuration. 3. A low-cost head slaved display is a cost-effective replacement of a traditional display and will not hamper training effectiveness.

Author

Training Simulators; Cost Effectiveness

20000120374 Institute for Human Factors TNO, Soesterberg, Netherlands

Exploration of Instruction in a Driving Simulator Interim Report Verkenning van Instructie in een Rijsimulator

vanEmmerik, M. L., Institute for Human Factors TNO, Netherlands; vanRooij, J. C. G. M., Institute for Human Factors TNO, Netherlands; deJong, T., Technische Hogeschool Twente, Netherlands; Sep. 09, 2000; 50p; In English

Contract(s)/Grant(s): B00-051; TNO Proj. 730.3

Report No.(s): TD-2000-0154; TM-00-B008; Copyright; Avail: Issuing Activity

The present experiment was set up to explore the process of instruction in a (driving) simulator. Relevant aspects in this study were the amount of instruction, events giving rise to instruction, and change of instructions in the course of the learning process. An experienced driving instructor trained twelve subjects during a driving simulator experiment. The difficulty of the tasks the subjects had to perform increased in four stages. Furthermore, each stage initially was trained without other traffic; other participants were introduced in the second part of a stage only. After each training session in which the subjects received instruction they had to drive a test without help. Afterwards the instructor judged their performance and subjects either progressed to the next stage or had to drive another training session with the same level of difficulty. Results. The attempt to find a reliable correlation between instructions and driver performance was largely unsuccessful. There was, however, a strong correspondence between driver performance and the instructor judgment on a higher level: Drivers judged as "good" (by the instructor) showed less variance in their performance measures than "bad" drivers. The emphasis of instruction clearly lied in the first two phases of the task to be learned. The amount of instruction gradually decreased. Although 38 different types of instructional utterances were observed during the experiment as much as 70% of all the instructions could be placed in 14 categories. During the present experiment provision of instructions could not be based on performance measurement alone. To give an overall judgment of driver skill, however, the performance measures were sufficient.

Author

Education; Simulators; Training Evaluation

20000120449 NASA Glenn Research Center, Cleveland, OH USA

Calibration of the NASA Glenn Research Center 10-by 10-ft Supersonic Wind Tunnel (1993 and 1995 Tests)

Arrington, E. Allen, DYNACS Engineering Co., Inc., USA; Spera, David A., DYNACS Engineering Co., Inc., USA; Blumenthal, Philip, DYNACS Engineering Co., Inc., USA; Thompson, June, NASA Glenn Research Center, USA; August 2000; 46p; In English

Contract(s)/Grant(s): NAS3-98008; RTOP 523-90-1A

Report No.(s): NASA/TM-2000-209799; E-12095; NAS 1.15:209799; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Facility calibration tests were conducted in the NASA Glenn Research Center 10- by 10-Foot Supersonic Wind Tunnel in 1991, 1993, and 1995. These were the first full calibration tests conducted in this facility since 1964. For all these tests an array of 17 supersonic wedge probes was used to survey the test section flow field at several planes over the tunnel's entire operating range. The data from the 1993 and 1995 tests were used to construct calibration relationships relating test section Mach number and total pressure recovery to several operating conditions (tunnel pressure, dew point level, and tunnel control settings). Measurements of local Mach number and local total pressure recovery in the free stream were correlated with cold tunnel operating parameters by using an empirical mathematical model designated CAL10X. This report contains the derivation of the latest revision of this model, CAL10X. 1, along with a detailed description of the facility, test hardware, and test procedures.

Author

Calibrating; Supersonic Wind Tunnels; Test Chambers; Wind Tunnel Tests

20000121224 NASA Glenn Research Center, Cleveland, OH USA

Test Section Flow Quality Surveys of the NASA Glenn Research Center Icing Research Tunnel (1994 Test)

Arrington, E. Allen, NYMA, Inc., USA; Gonzalez, Jose C., NYMA, Inc., USA; Pickett, Mark T., NASA Glenn Research Center,

USA; Sheldon, David W., NASA Glenn Research Center, USA; June 2000; 54p; In English

Contract(s)/Grant(s): NAS3-27186; RTOP 523-90-1A

Report No.(s): NASA/TM-2000-208510; NAS 1.15:208510; E-11362; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A series of aerodynamic flow-field surveys were conducted in the test section of the NASA Glenn Research Center Icing Research Tunnel. Several types of flow survey probes and mounting hardware were used to provide detailed information on the test section flow quality in terms of total and static pressure, total temperature, flow angularity and turbulence. These data will form the baseline data set for the facility and will be compared with data collected following proposed facility modifications (new spray bar systems and new heat exchanger). Detailed surveys were conducted at one station in the test section (typical research test plane). The data indicated that the pressure and Mach number variations over the survey plane were within specified goals over most of the operating airspeed range, although the flow angularity and total temperature goals were not met at many conditions.

Author

Flow Distribution; Ice Formation; Wind Tunnel Tests; Flow Measurement; Measuring Instruments; Air Flow; Turbulence; Wind Tunnels

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ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms.

20000120472 NASA Goddard Space Flight Center, Greenbelt, MD USA

Automation and Upgrade of Thermal System for Large 38-Year Young Test Facility

Webb, Andrew, ManTech Aerospace, USA; Twenty-first Space Simulation Conference: The Future of Space Simulation Testing in the 21st Century; October 2000, pp. 175; In English; See also 20000120453; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Goddard Space Flight Center's Space Environment Simulator (SES) facility has been improved by the upgrade of its thermal control hardware and software. This paper describes the preliminary design process, funding constraints, and the proposed enhancements as well as the installation details, the testing difficulties, and the overall benefits realized from this upgrade. The preliminary design process was discussed in a paper presented in October 1996 and will be recapped in this paper to provide background and comparison to actual product. Structuring the procurement process to match the funding constraints allowed Goddard to enhance its capabilities in an environment of reduced budgets. The installation of the new system into a location that has been occupied for over 38-years was one of the driving design factors for the size of the equipment. The installation was completed on-time and under budget. The tuning of the automatic sequences for the new thermal system to the existing shroud system required more time and ultimately presented some setbacks to the vendor and the final completion of the system. However, the end product and its benefits to Goddard's thermal vacuum test portfolio will carry the usefulness of this facility well into the next century.

Author

Temperature Control; Environmental Control; Space Simulators; Environment Simulators; Flight Simulators

20000118244 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-45/Atlas-1 TCDT Activities

Feb. 01, 1992; In English; Videotape: 21 min. 38 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2000148091; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Footage shows three T-38 aircraft coming in for landing at Kennedy Space Center (KSC) and jetting on the runway. The crew of Atlantis gets out of the cockpits and are introduced by Commander Charles F. Bolden to the press. The crew is also shown learning about the Atlas-01 module before suiting up to board Atlantis.

CASI

T-38 Aircraft; Crew Procedures (Preflight); Astronaut Training; Atlantis (Orbiter)

20000118257 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-43 Astronaut Arrival for TCDT

Jul. 01, 1991; In English; Videotape: 3 min. 8 sec. playing time, in color, with sound (no narration)

Report No.(s): NONP-NASA-VT-2000148071; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Footage is shown of two T-38 aircrafts jetting on the runway after landing. The crew of STS-43 is shown getting out of the cockpits and boarding a bus to leave the runway.

CASI

Astronauts; Crew Procedures (Preflight); T-38 Aircraft

20000118265 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-38 Atlantis Crew Arrival

Nov. 13, 1990; In English; Videotape: 18 min. 14 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2000113531; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Footage shows the Atlantis crew maneuvering and landing five T-38 aircrafts at Kennedy Space Center and greeting the crowd on the runway.

CASI

Atlantis (Orbiter); Crew Procedures (Preflight); T-38 Aircraft

20000120453 NASA Goddard Space Flight Center, Greenbelt, MD USA

Twenty-first Space Simulation Conference: The Future of Space Simulation Testing in the 21st Century

Stecher, Joseph L., III, Compiler, NASA Goddard Space Flight Center, USA; October 2000; 290p; In English, 23-26 Oct. 2000, Annapolis, MA, USA; Sponsored by NASA, USA; See also 20000120454 through 20000120486

Contract(s)/Grant(s): RTOP 622-51-31

Report No.(s): NASA/CP-2000-209967/Preprint; Rept-2000-04187-0/Preprint; NAS 1.55:209967/Preprint; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

The Institute of Environmental Sciences and Technology's Twenty-first Space Simulation Conference, "The Future of Space Testing in the 21st Century" provided participants with a forum to acquire and exchange information on the state-of-the-art in space simulation, test technology, atomic oxygen, programs/system testing, dynamics testing, contamination, and materials. The papers presented at this conference and the resulting discussions carried out the conference theme "The Future of Space Testing in the 21st Century."

Author

Conferences; Environment Simulation; Virtual Reality; Flight Simulation; Space Flight

11

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft.

20000120074 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

Elastic Tailoring of Aircraft Structures with Composites

Rehfield, Lawrence W., California Univ., USA; 2000 NASA-HU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; September 2000, pp. 71; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A significant attribute of laminated composites is their design flexibility. The layers or plies of a laminate are, in fact, modular units which can be selected to provide distinct material properties and fiber orientations. It is possible, therefore, to 'tailor' the properties of composites to meet specific design requirements. Engineers are learning to exploit this flexibility to produce unique structures tailored to the application. Tailoring normally consists of selecting an appropriate structural concept, material systems, fiber orientations, ply stacking sequence, in an optimization approach to achieve specific performance goals. Common tailoring goals are preventing structural instabilities or vibration resonances or enhancing damage tolerance. Tailoring is passive control of behavior. Desired behavior tendencies are designed into the structure as intrinsic qualities. The structure 'wants' to emulate the desired behavior by virtue of the tailoring of the configuration. Use of this technology requires a thorough understanding of behavioral mechanisms and the parameters that control them. If the desired results cannot be achieved by passive means alone, active or extrinsic control technology may be used as well. Generally, tailoring the basic structure will reduce the level of active control required for the desired mission of an aircraft. Along with possible weight savings for the control system, simplicity and reliability may be achieved also. The work completed this summer supports NASA's Aircraft Morphing Program. The purpose of this program is to develop active component technologies that enable self-adaptive flight for improved safety, affordability, environmental compatibility and performance. Structural tailoring may play a significant role in this effort. Among the

accomplishments of the summer are: (1) Closed form design analysis of laminated beams with bending-twist coupling; (2) Analysis of tailored box beams with bending-twist coupling; and (3) Submitted an abstract to AIAA based upon number two above. Tailoring of bending-twist coupling has particular significance for subsonic wings and other lifting surfaces. The analyses serve as a basis for the design of experiments that are planned as future work in the Mechanics and Durability Branch for this program.

Author

Aircraft Structures; Laminates; Research and Development; Design Analysis; Bending

20000120375 NASA Glenn Research Center, Cleveland, OH USA

High Cycle Fatigue Crack Initiation Study of Case Blade Alloy Rene 125

Kantzos, P., Ohio Aerospace Inst., USA; Gayda, J., NASA Glenn Research Center, USA; Miner, R. V., NASA Glenn Research Center, USA; Telesman, J., NASA Glenn Research Center, USA; Dickerson, P., NYMA, Inc., USA; August 2000; 38p; In English
Contract(s)/Grant(s): RTOP 523-24-13

Report No.(s): NASA/TM-2000-210359; E-12408; NAS 1.15:210359; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was conducted in order to investigate and document the high cycle fatigue crack initiation characteristics of blade alloy Rene 125 as cast by three commercially available processes. This alloy is typically used in turbine blade applications. It is currently being considered as a candidate alloy for high T3 compressor airfoil applications. This effort is part of NASA's Advanced Subsonic Technology (AST) program which aims to develop improved capabilities for the next generation subsonic gas turbine engine for commercial carriers. Wrought alloys, which are customarily used for airfoils in the compressor, cannot meet the property goals at the higher compressor exit temperatures that would be required for advanced ultra-high bypass engines. As a result cast alloys are currently being considered for such applications. Traditional blade materials such as Rene 125 have the high temperature capabilities required for such applications. However, the implementation of cast alloys in compressor airfoil applications where airfoils are typically much thinner does raise some issues of concern such as thin wall castability, casting cleanliness, and susceptibility to high-cycle fatigue (HCF) loading.

Author

Airfoils; Cast Alloys; Crack Initiation; Fatigue (Materials)

12

ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention.

20000121167 Physics and Electronics Lab. TNO, The Hague, Netherlands

Possibilities for Use of SAR on a UAV *Final Report*

vandenBroek, A. C., Physics and Electronics Lab. TNO, Netherlands; June 2000; 70p; In English; Original contains color illustrations

Contract(s)/Grant(s): A98/D/697; TNO Proj. 28219

Report No.(s): TD-99-0258; TNO-FEL-99-A228; Copyright; Avail: Issuing Activity

This report describes a study for the Dutch MOD concerning the role of the SAR/MTI sensor mounted on a UAV for the purpose of military intelligence. We describe different categories of UAVs and several military conflict scenarios. Depending on the conflict scenario, the need for military intelligence and the observation tasks for the UAV are investigated. Next we describe several implementations of the SAR/MTI sensor. Each implementation is then evaluated and analysed with respect to the observation tasks. The result of the analysis shows that there is especially a need for a SAR with high resolution in order to ensure recognition of targets as much as possible. A SAR with lower resolution can be advantageous for surveying large areas. An important implementation is the combination of a SAR and MTI sensor since this sensor is able to detect moving targets and simultaneously to image the surroundings.

Author

Synthetic Aperture Radar; Pilotless Aircraft; Moving Target Indicators

20000121190 Naval Postgraduate School, Monterey, CA USA

Computer Modeling of Jamming Effects on Roll Stabilized Missiles

Hill, Craig A.; September 2000; 74p; In English

Report No.(s): AD-A383426; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Development of countermeasures against infrared missiles is enhanced by an ability to quantify the effects of the countermeasure. Analysts must be capable of accurately determining the attitude of the missile throughout its flight. This thesis describes the use of micro-miniature technologies to measure the rates experienced by a missile and the model required to effectively determine the missile's attitude. The Applied Technology Associates ARS-04E and the Tokin America CG-16D sensors were evaluated for use as rate sensors and the Honeywell, SSEC, HMC 1002 was evaluated for use as a roll sensor. Of these sensors, the CG-16D proved its ability to perform in this application. The ARS-04E was ineffective in this application. A Simulink model is presented that performs the tasks of demodulating the sensors, performing coordinate transformation, and providing animation of the missile attitude for analysis. The model was evaluated for its ability to accurately determine the attitude of the missile based on input from the IMU packages. Sensor data was obtained from testing performed on a CARCO table flight motion simulator, and compared to the ground truth data provided by the CARCO table. Through testing, the model was capable of providing solutions within the 2 degrees RMS requirement.

DTIC

Computerized Simulation; Flight Simulators; Jamming; Microminiaturization

20000119022 Illinois Inst. of Tech., Chicago, IL USA

Controlled Experiments on Instabilities and Transition to Turbulence on Elliptic Cones at Hypersonic Mach Numbers *Final Report, 1 Feb. 1998-31 Oct. 1999*

Dollar, Marek, Illinois Inst. of Tech., USA; Corke, Thomas C., Illinois Inst. of Tech., USA; Oct. 31, 2000; 8p; In English
Contract(s)/Grant(s): F49620-98-1-0281

Report No.(s): AD-A383323; AFRL-SR-BL-TR-00-0550; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

This work involves the study of instabilities and transition to turbulence in boundary layers on cones at different angles of attacks at high supersonic and hypersonic Mach numbers. It utilizes facilities at NASA Langley Research Center which make use of 'quiet' design nozzles to minimize the level of acoustic disturbances. The experiments include design Mach numbers of 3.5, and 8.0, and involve two models. The first is a 70 half-angle circular cross-section cone which has been previously used by us in experiments without angle of attack, at Mach 3.5. We used this model during the past year in order to investigate the effects of angles of attack and free-stream disturbances at Mach 3.5. The second model was designed and constructed during the past year. It consists of a 100 half-angle cone with a 4:1 elliptic cross section. The cone mounts on a sting which places it inside the worst-case estimate of the location of the quiet zone in the new Mach 5 tunnel at NASA LaRC. The model is annealed and hardened to withstand the 9000 F free-stream temperature--and maintain a polished finish. A 3-D traversing mechanism capable of following the tapered elliptic surface, and operating at high temperatures in the hypersonic flow is presently being built. This will carry a miniature pitot probe or hot-wire sensor. Preliminary measurements with the elliptic cone at Mach 8 are planned for October.

DTIC

Turbulent Boundary Layer; Angle of Attack; Stability; Turbulence; Hypersonic Speed; Supersonic Speed

20000119082 Pennsylvania State Univ., Applied Research Lab., University Park, PA USA

Analysis of a Three-Dimensional Corner Flow with One Rough Surface *Final Report, 15 Jun. 1998-31 Dec. 1999*

Deutsch, Steven; Oct. 2000; 133p; In English

Contract(s)/Grant(s): N00014-96-1-1034

Report No.(s): AD-A383119; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Two and three-dimensional coincident velocity measurements were obtained in a turbulent corner flow at zero axial pressure gradient. Ten thousand coincident velocity ensembles were collected at each measurement location using a three component LDV system in the side-scatter mode. Measurements were made for two corner configurations; two hydrodynamically smooth surfaces, and one smooth and one fully rough surface ($k^+=90$). For the smooth-smooth configuration, centerline results compare favorably with classical flat plate data. Secondary flow structures associated with flow along the corner produced modification to the measured Reynolds stresses and triple correlations for the smooth-smooth condition. For the corner flow with one rough surface, the plots of the secondary velocity vectors suggest that the presence of the roughness has disrupted the flow structure.

DTIC

Corner Flow; Surface Roughness; Turbulent Flow; Wind Tunnel Tests; Three Dimensional Flow; Aerodynamic Interference

20000119944 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA

Compressible Boundary Layer Receptivity and Instability *Final Report, 1 Dec. 1998-31 Aug. 1999*

Brown, Garry L., Princeton Univ., USA; Graziosi, Paolo, Princeton Univ., USA; Oct. 13, 2000; 17p; In English

Contract(s)/Grant(s): F49620-99-1-0066

Report No.(s): AD-A383321; AFRL-SR-BL-TR-00-0552; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

A high quality flow has been established in a low turbulence variable geometry (LTVG) 8 x 8' supersonic wind-tunnel at Princeton. In particular, the facility is being operated at very low stagnation pressures (approx. four psia) giving a large region of laminar flow on a flat plate with laminar boundary layers up to approximately three millimeters thick. Mean profiles, amplitude distributions, two wire correlations and spectra have been measured in detail through a Mach 3 boundary layer along the centerline of the flat plate. The initial results are for 'naturally' occurring instability and transition and they are being followed by measurements of the forced response from a point source (spark).

DTIC

Supersonic Wind Tunnels; Boundary Layers; Compressible Boundary Layer; Wind Tunnel Tests

2000011992 Vrije Univ., Dept. of Fluid Mechanics, Brussels, Belgium

Shock Representation by Euler Throughflow Models and Comparison With Pitch-Averaged Navier-Stokes Solutions

Sturmayer, Andreas, Vrije Univ., Belgium; Hirsch, C., Vrije Univ., Belgium; [1999]; 16p; In English

Report No.(s): AD-A373363; ISABE-99-7281; Copyright; Avail: Issuing Activity

The shock capturing properties of the axisymmetric Euler throughflow equations in design mode (imposed swirl) and in analysis mode (imposed flow angle) are examined through formulation of the Rankine-Hugoniot relations. A new, hybrid mode is constructed that combines properties of the two classical modes. The consequences of the different shock representation in the several modes are illustrated for five characteristic operating points covering the complete design speed performance curve of a transonic axial compressor rotor. Circumferentially averaged 3D Navier-Stokes solutions serve as a reference. A comprehensive comparison of the throughflow and averaged 3D flow fields is presented. The analysis mode, due to captured shocks, predicts a wrong flow field inside the blade passage, yet is reasonably accurate globally. The design and hybrid modes, due to identical shock capturing properties, give near- identical solutions, which are in excellent agreement with the pitch-averaged 3D reference solutions.

DTIC

Navier-Stokes Equation; Transonic Compressors; Computational Fluid Dynamics; Euler Equations of Motion; Supersonic Flow; Axial Flow; Rankine-Hugoniot Relation; Shock Wave Propagation

20000120037 NASA Langley Research Center, Hampton, VA USA

Forced Boundary-Layer Transition on X-43 (Hyper-X) in NASA LaRC 20-Inch Mach 6 Air Tunnel

Berry, Scott A., NASA Langley Research Center, USA; DiFulvio, Michael, NASA Langley Research Center, USA; Kowalkowski, Matthew K., NASA Langley Research Center, USA; August 2000; 63p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 242-80-01-01

Report No.(s): NASA/TM-2000-210316; L-18016; NAS 1.15:210316; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Aeroheating and boundary layer transition characteristics for the X-43 (Hyper-X) configuration have been experimentally examined in the Langley 20-Inch Mach 6 Air Tunnel. Global surface heat transfer distributions, and surface streamline patterns were measured on a 0.333-scale model of the Hyper-X forebody. Parametric variations include angles-of-attack of 0-deg, 2-deg, and 4-deg; Reynolds numbers based on model length of 1.2 to 15.4 million; and inlet cowl door both open and closed. The effects of discrete roughness elements on the forebody boundary layer, which included variations in trip configuration and height, were investigated. This document is intended to serve as a release of preliminary data to the Hyper-X program; analysis is limited to observations of the experimental trends in order to expedite dissemination.

Author

Aerodynamic Heating; Boundary Layer Transition; Wind Tunnel Tests

20000120047 NASA Langley Research Center, Hampton, VA USA

Forced Boundary-Layer Transition on X-43 (Hyper-X) in NASA LaRC 31-Inch Mach 10 Air Tunnel

Berry, Scott A., NASA Langley Research Center, USA; DiFulvio, Michael, NASA Langley Research Center, USA; Kowalkowski, Matthew K., NASA Langley Research Center, USA; August 2000; 78p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 242-80-01-01

Report No.(s): NASA/TM-2000-210315; L-18017; NAS 1.15:210315; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Aeroheating and boundary layer transition characteristics for the X-43 (Hyper-X) configuration have been experimentally examined in the Langley 31-Inch Mach 10 Air Tunnel. Global surface heat transfer distributions, and surface streamline patterns were measured on a 0.333-scale model of the Hyper-X forebody. Parametric variations include angles-of-attack of 0-deg, 2-deg, 3-deg, and 4-deg; Reynolds numbers based on model length of 1.2 to 5.1 million; and inlet cowl door both open and closed. The effects of discrete roughness elements on the forebody boundary layer, which included variations in trip configuration and height, were investigated. This document is intended to serve as a release of preliminary data to the Hyper-X program; analysis is limited to observations of the experimental trends in order to expedite dissemination.

Author

Aerodynamic Heating; Boundary Layer Transition; Wind Tunnel Tests

20000120399 NASA Glenn Research Center, Cleveland, OH USA

Rudder/Fin Seal Investigations for the X-38 Re-Entry Vehicle

Dunlap, Patrick H., Jr., NASA Glenn Research Center, USA; Steinetz, Bruce M., NASA Glenn Research Center, USA; Curry, Donald M., NASA Johnson Space Center, USA; November 2000; 22p; In English; 36th; Joint Propulsion, 16-19 Jul. 2000, Huntsville, AL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 505-23-OU

Report No.(s): NASA/TM-2000-210338/REV1; E-12384/REV1; AIAA Paper 2000-3508; NAS 1.15:210338/REV1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NASA is currently developing the X-38 vehicle that will be used to demonstrate the technologies required for a crew return vehicle (CRV) for the International Space Station. The X-38 control surfaces require high temperature seals to limit hot gas ingestion and transfer of heat to underlying low-temperature structures to prevent over-temperature of these structures and possible loss of the vehicle. This paper presents results for thermal analyses and flow and compression tests conducted on as-received and thermally exposed seals for the rudder/fin location of the X-38. A thermal analysis of the rudder/fin dual seal assembly based on representative heating rates on the windward surface of the rudder/fin area predicted a peak seal temperature of 1900 F. The temperature-exposed seals were heated in a compressed state at 1900 F corresponding to the predicted peak temperature. Room temperature compression tests were performed to determine load versus linear compression, preload, contact area, stiffness, and resiliency characteristics for the as-received and temperature-exposed seals. Temperature exposure resulted in permanent set and loss of resiliency in these seals. Unit loads and contact pressures for the seals were below the five pounds/inch and ten psi limits set to limit the loads on the Shuttle thermal tiles that the seals seal against in the rudder/fin location. Measured seal flow rates for a double seal were about 4.5 times higher than the preliminary seal flow goal. The seal designs examined in this study are expected to be able to endure the high temperatures that they will be exposed to for a single-use life. Tests performed herein combined with future analyses, arc jet tests, and scrubbing tests will be used to select the final seal design for this application.

Author

Reentry Vehicles; X-38 Crew Return Vehicle; Compression Tests; Fins; Rudders; Thermal Analysis

20000120215 DYNACS Engineering Co., Inc., Brook Park, OH USA

High Energy Flywheel Containment Evaluation *Final Report*

Colozza, Anthony J., DYNACS Engineering Co., Inc., USA; October 2000; 18p; In English

Contract(s)/Grant(s): NAS3-98008; RTOP 344-96-6A

Report No.(s): NASA/CR-2000-210508; E-12477; NAS 1.26:210508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A flywheel testing facility is being constructed at the NASA Glenn Research Center. This facility is to be used for life cycle testing of various flywheel rotors. The lifecycle testing consists of spinning a rotor from a low rpm (approx. 20,000) to a high rpm (approx. 60,000) and then back to the low rpm. This spin cycle will model that which the rotor will see during use. To simulate the lifetime of the rotor, the spin cycle will be performed tens of thousands of times. A typical life cycle spin test is expected to last six months. During this time the rotor will be spun through a cycle every five minutes. The test will run continuously for the six month period barring a flywheel failure. Since it is not reasonable to have the surrounding area evacuated of personnel for the duration of the testing, the flywheel facility has to be designed to withstand a flywheel rotor failure and insure that there is no danger to any personnel in the adjacent buildings or surrounding areas. In order to determine if the facility can safely contain a flywheel rotor failure an analysis of the facility in conjunction with possible flywheel failure modes was performed. This analysis is intended as a worst case evaluation of the burst liner and vacuum tank's ability to contain a failure. The test chamber consists of a cylindrical stainless steel vacuum tank, two outer steel containment rings, and a stainless steel burst liner. The stainless steel used is annealed 302, which has an ultimate strength of 620 MPa (90,000 psi). A diagram of the vacuum tank configuration is

shown. The vacuum tank and air turbine will be located below ground in a pit. The tank is secured in the pit with 0.3 m (12 in.) of cement along the base and the remaining portion of the tank is surrounded by gravel up to the access ports. A 590 kg (1300 lb.) bulkhead is placed on top of the pit during operation and the complete facility is housed within a concrete structure which has 7.5 cm (3 in.) thick walls. A cutaway of the facility is shown.

Author

Flywheels; Rotors; Test Chambers; Test Facilities; Experiment Design; Containment

20000120390 NASA Glenn Research Center, Cleveland, OH USA

Lessons Learned During Solutions of Multidisciplinary Design Optimization Problems

Patnaik, Suna N., Ohio Aerospace Inst., USA; Coroneos, Rula M., NASA Glenn Research Center, USA; Hopkins, Dale A., NASA Glenn Research Center, USA; Lavelle, Thomas M., NASA Glenn Research Center, USA; August 2000; 26p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC3-738; RTOP 714-04-50

Report No.(s): NASA/TM-2000-210363; E-11992; NAS 1.15:210363; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Optimization research at NASA Glenn Research Center has addressed the design of structures, aircraft and airbreathing propulsion engines. During solution of the multidisciplinary problems several issues were encountered. This paper lists four issues and discusses the strategies adapted for their resolution: (1) The optimization process can lead to an inefficient local solution. This deficiency was encountered during design of an engine component. The limitation was overcome through an augmentation of animation into optimization. (2) Optimum solutions obtained were infeasible for aircraft and air-breathing propulsion engine problems. Alleviation of this deficiency required a cascading of multiple algorithms. (3) Profile optimization of a beam produced an irregular shape. Engineering intuition restored the regular shape for the beam. (4) The solution obtained for a cylindrical shell by a subproblem strategy converged to a design that can be difficult to manufacture. Resolution of this issue remains a challenge. The issues and resolutions are illustrated through six problems: (1) design of an engine component, (2) synthesis of a subsonic aircraft, (3) operation optimization of a supersonic engine, (4) design of a wave-rotor-topping device, (5) profile optimization of a cantilever beam, and (6) design of a cylindrical shell. The combined effort of designers and researchers can bring the optimization method from academia to industry.

Author

Research and Development; Aircraft Design; Engine Design; Multidisciplinary Design Optimization; Problem Solving

13

GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology.

20000116506 NASA Goddard Space Flight Center, Greenbelt, MD USA

BOREAS AFM-2 King Air 1994 Aircraft Flux and Moving Window Data

Kelly, Robert D., Wyoming Univ., USA; Hall, Forrest G., Editor, NASA Goddard Space Flight Center, USA; Newcomer, Jeffrey A., Editor, Raytheon Information Technology and Scientific Services, USA; June 2000; 60p; In English

Contract(s)/Grant(s): RTOP 462-33-01

Report No.(s): NASA/TM-2000-209891/VOL2; Rept-2000-03136-0/VOL2; NAS 1.15:209891/VOL2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The BOREAS AFM-2 team collected pass-by-pass fluxes (and many other statistics) for a large number of level (constant altitude), straight-line passes used in a variety of flight patterns. The data were collected by the University of Wyoming King Air in 1994 BOREAS IFCs 1-3. Most of these data were collected at 60-70 m above ground level, but a significant number of passes were also flown at various levels in the planetary boundary layer, up to about the inversion height. This documentation concerns only the data from the straight and level passes that are presented as original (over the NSA and SSA) and moving window values (over the Transect). Another archive of King Air data is also available, containing data from all the soundings flown by the King Air 1994 IFCs 1-3. The data are stored in tabular ASCII files.

Author

Airborne Equipment; Aircraft Equipment; Meteorology; Atmospheric Physics

20000116508 NASA Goddard Space Flight Center, Greenbelt, MD USA

BOREAS AFM-2 Wyoming King Air 1994 Aircraft Sounding Data

Kelly, Robert D., Wyoming Univ., USA; Hall, Forrest G., Editor, NASA Goddard Space Flight Center, USA; Knapp, David E., Editor, Raytheon Information Technology and Scientific Services, USA; June 2000; 26p; In English

Contract(s)/Grant(s): RTOP 462-33-01

Report No.(s): NASA/TM-2000-209891/VOL3; Rept-2000-03136/VOL3; NAS 1.15:209891/VOL3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The BOREAS AFM-2 team used the University of Wyoming King Air aircraft during IFCs 1, 2, and 3 in 1994 to collect pass-by-pass fluxes (and many other statistics) for the large number of level (constant altitude), straight-line passes used in a variety of flight patterns over the SSA and NSA and areas along the transect between these study areas. The data described here form a second set, namely soundings that were incorporated into nearly every research flight by the King Air in 1994. These soundings generally went from near the surface to above the inversion layer. Most were flown immediately after takeoff or immediately after finishing the last flux pattern of that particular day's flights. The parameters that were measured include wind direction, wind speed, west wind component (u), south wind component (v), static pressure, air dry bulb temperature, potential temperature, dewpoint, temperature, water vapor mixing ratio, and CO₂ concentration. Data on the aircraft's location, attitude, and altitude during data collection are also provided. These data are stored in tabular ASCH files.

Author

Airborne Equipment; Aircraft Equipment; Meteorology; Meteorological Instruments; Rocket Sounding; Sounding Rockets

20000116613 NASA Goddard Space Flight Center, Greenbelt, MD USA

BOREAS AFM-3 NCAR Electra 1994 Aircraft Flux and Moving Window Data

Lenschow, Donald H., National Center for Atmospheric Research, USA; Hall, Forrest G., Editor, NASA Goddard Space Flight Center, USA; Knapp, David E., Editor, Raytheon Information Technology and Scientific Services, USA; Shanot, Al, National Center for Atmospheric Research, USA; Oncley, Steven P., National Center for Atmospheric Research, USA; Cooper, Al, National Center for Atmospheric Research, USA; June 2000; 60p; In English

Contract(s)/Grant(s): RTOP 462-33-01

Report No.(s): NASA/TM-209891/VOL4; Rept-2000-03136-0/VOL4; NAS 1.15:209891/VOL4; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The BOREAS AFM-3 team used the NCAR Electra aircraft data to make measurements of the fluxes of momentum, sensible and latent heat, carbon dioxide, and ozone over the entire BOREAS region to tie together measurements made in both the SSA and the NSA in 1994. These data were also used to study the planetary boundary layer using both in situ and remote sensing measurements. This data set contains both the aircraft flux and the moving window data. These data are stored in tabular ASCII files.

Author

Electra Aircraft; Aircraft Equipment; Airborne Equipment; Measuring Instruments; Meteorological Instruments; Remote Sensing

20000118229 NASA Goddard Space Flight Center, Greenbelt, MD USA

Measurements and Calculations of Microwave Radiance and Reflectivity for Storm-Associated Frozen Hydrometeors

Wang, James R., NASA Goddard Space Flight Center, USA; Skofronick-Jackson, Gail, NASA Goddard Space Flight Center, USA; Meneghini, Robert, NASA Goddard Space Flight Center, USA; Heymsfield, Gerald, NASA Goddard Space Flight Center, USA; Manning, Will, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 9-12 Oct. 2000, Sendai, Japan; No Copyright; Avail: Issuing Activity; Abstract Only

During the TEFLUN-B (Texas-Florida under-flights for the Tropical Rainfall Measuring Mission (TRMM)) field experiment of August-September, 1998, a number of ER-2 aircraft flights with a host of microwave instruments were conducted over many convective storms, including some hurricanes, in the coastal region of Florida and Texas. These instruments include MIR (Millimeter-wave Imaging Radiometer), AMPR (Advanced Microwave Precipitation Radiometer), and EDOP (ER-2 Doppler Radar). EDOP is operated at the frequency of 9.7 GHz, while the AMPR and the MIR together give eleven channels of radiometric measurements in the frequency range of 10-340 GHz. The concurrent measurements from these instruments provide unique data sets for studying the details of the microphysics of hydrometeors. Preliminary examination of these data sets shows features that are generally well understood; i.e., radiometric measurements at frequencies less than or equal to 37 GHz mainly respond to rain, while those at frequencies greater than 150 GHz, to snow and ice clouds above the freezing level. In this paper we present results of comparisons between these measurements and model calculations of brightness temperature and radar reflectivity. For simplicity the analysis is limited to the anvil region of the storms where only frozen hydrometeors are present. Various models

of particle size distribution (e.g., Gunn-Marshall, Sekhon-SRivastava, and the Central Equatorial Pacific Experiment (CEPEX)) are examined in the calculations of brightness temperatures at the MIR frequencies and radar reflectivity at the EDOP frequency. Estimation of ice water path is made based on the best agreement between the measurements and calculations of brightness temperature and reflectivity. Problems associated with these analyses and measurement accuracy will be discussed.

Author

Frequency Ranges; Hydrometeors; Microwave Imagery; Microwave Radiometers; Microwave Sensors; Radiance; Reflectance; Radiometers; Aircraft Instruments

20000119028 NASA Goddard Space Flight Center, Greenbelt, MD USA

LANDSAT-7 ETM+ On-Orbit Radiometric Calibration

Markham, Brian L., NASA Goddard Space Flight Center, USA; Kaita, Ed, NASA Goddard Space Flight Center, USA; Miller, Jeff, NASA Goddard Space Flight Center, USA; Barsi, Julia, NASA Goddard Space Flight Center, USA; [2000]; 2p; In English; Characterization and Radiometric Calibration for Remote Sensing, 19-22 Sep. 2000, Logan, UT, USA; No Copyright; Avail: Issuing Activity; Abstract Only

As of July, 2000 the Enhanced Thematic Mapper Plus (ETM+) sensor on LANDSAT-7 has been operating on-orbit for about 15 months. The ETM+ images the Earth in has eight spectral bands in the visible, near-infrared (IR), short wavelength infrared (SWIR), and thermal portions of the spectrum. Three on-board calibration systems are available for the reflective bands: (1) the Internal Calibrator (IC), (2) the Partial Aperture Solar Calibrator (PASC), and (3) the Full Aperture Solar Calibrator (FASC). The Internal Calibrator also provides the thermal band calibration. Several investigators on the LANDSAT science team are also regularly performing vicarious calibrations. The internal calibrator, which during much of the pre-launch testing and early on-orbit check out period, showed up to 15% variability with time, has since stabilized as the instrument has assumed a regular schedule of operations and is now typically showing only a few percent variation with time, mostly associated with warm-up. The PASC has been the most variable of the sources: the response to the PASC has increased by as much as 50% in some bands and is oscillating with time, perhaps due to contamination. The FASC has been the most stable of the sources: mid scan response to the FASC diffuser have varied from -4%/yr for band 4 (0.83 microns) to -2%/yr for band 1 (0.49 microns) to +1%/yr for band 7 (2.2 microns). These decreases in response in bands 1-4 would have been about half as large if measured on the right (west) side of the panel and about twice as large if measured on the left side of the panel. The current interpretation is that the FASC diffuser panel is changing non-uniformly in its reflectance characteristics. Vicarious ground measurements have generally been consistent with the pre-launch measurements of the instrument responsivity and have not shown evidence of a change in responsivity with time. The FASC, IC, and vicarious results suggest the instrument has not changed by more than two percent in responsivity since launch and that the absolute calibration is good to the advertised five percent.

Author

Calibrating; Infrared Radiation; Infrared Spectra; Thematic Mappers (LANDSAT); Flight Characteristics

20000116232 Harris, Miller, Miller and Hanson, Inc., Lexington, MA USA

Mitigating the Effects of Military Aircraft Overflights on Recreational Users of Parks *Final Report, Dec. 1995 - Jul. 1999*

Miller, Nicholas P.; Anderson, Grant S.; Horonjeff, Richard D.; Thompson, Richard H.; Baumgartner, Robert M.; Jul. 1999; 251p; In English; Prepared in cooperation with Hagler Bailly Consulting, Madison, WI.

Contract(s)/Grant(s): F41624-96-C-9002; AF Proj. 3037

Report No.(s): AD-A379467; Rept-294470.04; AFRL-HE-WP-TR-2000-0034; No Copyright; Avail: Defense Technical Information Center (DTIC)

This study was initiated as part of the cooperative US Air Force/National Park Service efforts to understand and effectively manage the potential adverse effects military air crew training can have on the National Parks. Through simultaneous sound data acquisition and Park user interviews, data were collected that provided a basis for determining how military jet overflights can affect visitor experience at a site in White Sands National Monument, New Mexico. Several useful findings resulted from the analysis. First, visitors can distinguish between the concepts of "annoyance" and "interference" produced by aircraft sound. Annoyance is an emotional reaction, while interference is more of an objective judgment. Visitors can find that the sound of aircraft interferes with the natural soundscape, but are not necessarily annoyed. Visitors believe annoyance results if the interference is often or severe enough. Second, visitors tend to be less annoyed by aircraft noise if they remember learning that they could hear or see aircraft while in the Park. This finding shows the importance of informing visitors about possible aircraft overflights - i.e., managing visitor expectations. Finally, aircraft noise is likely to produce less annoyance if aircraft fly over in close succession, rather than widely spaced, one at a time.

DTIC

Noise Pollution; Aircraft Noise; National Parks; Emotional Factors

20000117709 Analytical Technology Applications Corp., Sunnyvale, CA USA

Integrated Noise Model (INM) Version 6.0 User's Guide *Final Report, Jan. 1997 - Sep. 1999*

Gulding, J.; Fleming, G.; Olmstead, J.; Fleming, G.; D'Aprile, J.; Sep. 1999; 318p; In English

Report No.(s): PB2000-108002; FAA-AEE-99-03; No Copyright; Avail: CASI; A03, Microfiche; A14, Hardcopy

The Federal Aviation Administration, Office of Environment and Energy, Noise Division (AEE-100) has developed Version 6.0 of the integrated Noise Model (INM) with support from the ATAC Corporation and the Department of Transportation Volpe National Transportation Center. New features in INM 6.0 include: four new aircraft; modified engine and aerodynamic coefficients for ten aircraft; approach and departure average noise spectra for all aircraft; C-weighted noise metrics for low frequency noise analysis; NPD curves using SAE-APR-866A atmospheric absorption; a new function to compute pounds thrust using EPR or N1 values; a revised acceleration algorithm for computing procedural profiles; a jet thrust equation for high temperature/altitude cases; a subdivided first climb segment for more accurate exposure calculation; a revised noise exposure fraction algorithm for more accurate exposure calculation; a revised noise exposure fraction algorithm for more processing; flight segment significance testing for faster run time; 32-bit NMPlot contour generation; and support for long directory names. INM Version 6.0 software runs on PCs using a minimum hardware configuration of a Pentium II processor, Microsoft Windows 95, 98, or NT 4.0 operating systems, 64-Mb RAM, mouse input device, hard disk drive, and CD-ROM drive.

NTIS

User Manuals (Computer Programs); Aircraft Noise; Engine Noise; Aerodynamic Noise; Computer Programs

20000120066 Old Dominion Univ., Norfolk, VA USA

General Aviation Simulator (GAS) Baseline Study for Advanced Weather Information Display Program

Lee, Mark D., Old Dominion Univ., USA; 2000 NASA-HU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program; September 2000, pp. 63; In English; See also 20000120048; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Advanced Weather Information (AWIN) program has a goal of reducing General Aviation (GA) accidents due to weather by fifty percent. To help achieve this goal the Operator Support Team (OST) within the NASA Langley Crew Vehicle Integration Branch (CVIB) has a research plan to examine the introduction of new weather displays into the GA cockpit. NASA maintains a General Aviation Simulator (GAS), that although inoperative for several years, is being brought on-line to support the AWIN program. Several studies were conducted to understand the baseline characteristics of the simulator. The goal was to develop a baseline AWIN simulation scenario, document the characteristics of the simulator, and to run some baseline human performance tests under weather conditions that vary from Visual Flight Rules (VFR) to Instrument Flight Rules (IFR). First, the simulator user interface was documented from the perspective of the pilot user and the simulator operator (real-time console user). The simulator was modified in many ways, and the Simulation Modification Requests (SMRs) are documented. The flight qualities of the simulator were examined in two separate studies. In the first study, a simple check ride procedure was used to examine flight qualities under visual and instrument flight conditions. Several recommendations were provided by the pilot for improving the simulation. In the second study, a subset of the flight model parameters were adjusted across three sessions to help make the handling qualities of the aircraft more representative of a GA aircraft. In a third study a pilot with a visual flight rating was tested in a scenario that included a transition between VFR weather conditions and IFR weather conditions. The set of experimental procedures, forms, weather stimuli, and simulator data file outputs were defined and documented. The pilot's decision making process was assessed using post mission interviews and subjective workload ratings were collected using the NASA Task Load Index (TLX). The results of this first run are still being analyzed, but the preliminary analysis indicates that the weather scenarios will be effective. Issues associated with the use of the current GA simulator (e.g. the reduced field of view relative to actual flight in GA aircraft) were identified and documented for the AWIN program. In addition, avenues for further research and improvements to the simulator were identified and documented.

Author

Research and Development; Flight Simulators; Real Time Operation; Display Devices; In-Flight Simulation

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions.

20000115495 Air Force Academy, Dept. of Behavioral Sciences and Leadership, CO USA

Development of a Basic Flight Instruction Tutoring System (BFITS) Research Station

Miller, James C.; Kirk, Michael T.; Flynn, John S.; Hurt, Morgan P.; Schlueter, Jeffrey C.; Apr. 2000; 48p; In English

Report No.(s): AD-A381920; HERC-2000-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Basic Flight Instruction Tutoring System (BFITS) was designed to observe and track the behavior of students as they attempt to learn basic flight procedures. Several modifications were required to adapt the BFITS to the needs of researchers at the USA Air Force Academy. These modifications were accomplished by a team of five cadets enrolled in Behavioral Sciences 473, Human Factors Engineering, and their instructor. A limited test and evaluation assured that the BFITS research station worked as desired. The BFITS is a rich resource for investigations of fundamental learning processes associated with novice pilot learning. It may be used extensively as a tool to support faculty and cadet investigations of those processes.

DTIC

Flight Training; Human Factors Engineering; Flight Simulators; Flight Simulation; Universities

20000121242 Air Force Academy, Human-Environmental Research Center, CO USA

Women in Military Aviation, Aug. 1999 - May 2000

Waterman, Katrine M., Air Force Academy, USA; Miller, James C., Air Force Academy, USA; May 31, 2000; 27p; In English

Report No.(s): AD-A381795; USAFA-TR-2000-06; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

As women become increasingly involved in the world of aviation and combat flying roles, questions concerning gender issues in the cockpit are becoming extremely relevant. Some of the most significant areas of concern dealing with women in the cockpit are behavior, body composition, anthropometry, biomechanics, physiology, health, and learning. This project addresses these seven areas of concern for women in military aviation. We conducted this review through a literature search, and through interviews with both women and men in the operational Air Force and the civilian world. In addition, a computer-based simulator was used to compare the learning characteristics between men and women for basic flying skills. All the research cited reached the same general conclusions. There is no difference in the abilities of men and women to perform successfully and safely in an aviation career. The statistical analysis of the data collected for this experiment produced similar results; there was no significant difference between men and women in any of the four measures used to test basic flying performance. Overall, both men and women are physically and mentally equally qualified to pursue aviation careers.

DTIC

Females; Cockpits; Occupation; Human Performance; Sex Factor; Pilots (Personnel)

20000121325 Naval Postgraduate School, Monterey, CA USA

Determinants of Flight Training Performance: An Analysis of the Impact of Undergraduate Academic Background

Reis, Paul M., Naval Postgraduate School, USA; June 2000; 76p; In English

Report No.(s): Ad-A381146; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This thesis uses pre-commissioning academic and demographic factors, along with flight school performance data to measure pilot success in flight school. The goal is to determine if undergraduate major or school attended affect flight school performance. Measure of effectiveness include: (1) Flight School Completion Status, (2) Aviation Pre-Flight Indoctrination Composite Scores, and (3) Primary Flight Training Composite Scores. Recruitment for naval aviators is focused on individuals with "technical majors," according to present policy of the Naval Recruiting Command. This recruiting philosophy is based on the "Rickover Hypothesis," which postulates that naval officers with technical degrees are superior to naval officers with non-technical degrees. The Logit model showed that aviators with engineering degrees have a statistically greater chance of completing flight school than aviators with non-engineering technical or non-technical degrees. In addition, the results showed an association between academic background and flight school performance. This research justifies the current Navy policy of concentrating aviator recruitment efforts on individuals with technical degrees.

DTIC

Aircraft Pilots; Flight Training; Human Performance; Pilot Selection

20000121128 Lockheed Martin Engineering and Science Services, Moffett Field, CA USA

A Solid-State Compressor for Integration of CO₂ Removal and Reduction Assemblies

Mulloth, Lila M., Lockheed Martin Engineering and Science Services, USA; Finn, John E., NASA Ames Research Center, USA; [2000]; 1p; In English; Environmental Systems, 10-13 Jul. 2000, Toulouse, France

Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

Integration of CO₂ removal and reduction assemblies in a spacecraft air revitalization system requires an interface with the functionality of a vacuum pump/compressor and a buffer tank. The compressor must meet the vacuum needs of the CO₂ removal unit and the pressure needs of the CO₂ reduction device, and must also store sufficient CO₂ to accommodate the differences in cycle times of the two processes. In this presentation, we describe the design and operation of an adsorption-based device sized for use on the International Space Station. The adsorption compressor functions at a power level approximately ten times lower than a comparable mechanical compression/buffer tank system. The unit is also smaller, lighter, and quieter than its mechanical counterpart.

Author

Air Purification; Carbon Dioxide Removal; Compressors; Life Support Systems

15

MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science.

20000116305 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Adapting Air Force Practices to Cope with a Vanishing Integrated Circuit Supply Base - Maintaining the Technological Edge

Raines, Christopher R.; Apr. 04, 2000; 82p; In English

Report No.(s): AD-A382459; AFIT-CY-00359; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This Policy Analysis Exercise (PAE) was developed in consultation with RAND Corporation's Project AIR FORCE (PAF) Team. PAF is a Federally Funded Research and Development Center that has been providing analysis to the Air Force for over fifty years. The mission of the Project AIR FORCE Team is "to conduct an integrated program of objective analysis on issues of enduring concern to the leaders of the Air Force."

DTIC

Integrated Circuits; Avionics; Aircraft Engines

16

PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics.

20000121166 Oregon State Univ., Corvallis, OR USA

Two Projectiles Connected by a Flexible Tether Dropped in the Atmosphere *Final Report, Apr. 1998 - Mar. 1999*

Frost, Geoffrey W., Oregon State Univ., USA; Costello, Mark F., Oregon State Univ., USA; July 2000; 46p; In English

Report No.(s): AD-A379902; ARL/APG-CR-453; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This study investigates the atmospheric flight dynamics of a munition system that is released from an aircraft at altitude and drops toward a target on the ground. The munition system consists of two projectiles connected by a tether line. Initially, the two projectiles are rigidly attached. At a specified time, the projectiles separate and subsequently unreel the tether line. After the tether line is fully paid out, the system settles toward a steady state as it approaches the ground. It is shown that while projectile position results converge for a relatively low number of tether line elements, the maximum tether loads require a significantly larger number of elements. For a low follower-to-lead projectile mass ratio, the tether line unreeling process is predominantly due to the follower and lead projectile separation. Conversely, for a high follower-to-lead projectile mass ratio, the tether line tends to billow and subsequently unreel itself, independent of the lead and follower projectile motion.

DTIC

Projectiles; Simulation; Tethering; Aerodynamic Forces; Ammunition

20000116644 Allied-Signal Engines and Systems, Phoenix, AZ USA

Small Engine Technology (SET) - Task 13 ANOPP Noise Prediction for Small Engines: Jet Noise Prediction Module, Wing Shielding Module, and System Studies Results *Final Report*

Lieber, Lysbeth, Allied-Signal Engines and Systems, USA; September 2000; 177p; In English

Contract(s)/Grant(s): NAS3-27483; RTOP 538-03-13-01

Report No.(s): NASA/CR-2000-209706; L-21-10786; NAS 1.26:209706; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This Final Report has been prepared by AlliedSignal Engines and Systems, Phoenix, Arizona, documenting work performed during the period May 1997 through June 1999, under the Small Engines Technology Program, Contract No. NAS3-27483, Task Order 13, ANOPP Noise Prediction for Small Engines. The report specifically covers the work performed under Subtasks 4, 5 and 6. Subtask 4 describes the application of a semi-empirical procedure for jet noise prediction, subtask 5 describes the development of a procedure to predict the effects of wing shielding, and subtask 6 describes the results of system studies of the benefits of the new noise technology on business and regional aircraft.

Author

Engine Design; Jet Aircraft Noise; Noise Prediction (Aircraft); Aeroacoustics; Engine Noise; Quiet Engine Program; Noise Intensity; Noise Reduction

20000120267 General Electric Co., Aircraft Engines, Cincinnati, OH USA

Aeroacoustic Prediction Codes

Gliebe, P, General Electric Co., USA; Mani, R., General Electric Co., USA; Shin, H., General Electric Co., USA; Mitchell, B., General Electric Co., USA; Ashford, G., General Electric Co., USA; Salamah, S., General Electric Co., USA; Connell, S., General Electric Co., USA; August 2000; 324p; In English

Contract(s)/Grant(s): NAS3-27720; RTOP 522-81-11

Report No.(s): NASA/CR-2000-210244; E-12363; NAS 1.26:210244; R99AEB169; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

This report describes work performed on Contract NAS3-27720AoI 13 as part of the NASA Advanced Subsonic Transport (AST) Noise Reduction Technology effort. Computer codes were developed to provide quantitative prediction, design, and analysis capability for several aircraft engine noise sources. The objective was to provide improved, physics-based tools for exploration of noise-reduction concepts and understanding of experimental results. Methods and codes focused on fan broadband and 'buzz saw' noise and on low-emissions combustor noise and complement work done by other contractors under the NASA AST program to develop methods and codes for fan harmonic tone noise and jet noise. The methods and codes developed and reported herein employ a wide range of approaches, from the strictly empirical to the completely computational, with some being semiempirical analytical, and/or analytical/computational. Emphasis was on capturing the essential physics while still considering method or code utility as a practical design and analysis tool for everyday engineering use. Codes and prediction models were developed for: (1) an improved empirical correlation model for fan rotor exit flow mean and turbulence properties, for use in predicting broadband noise generated by rotor exit flow turbulence interaction with downstream stator vanes; (2) fan broadband noise models for rotor and stator/turbulence interaction sources including 3D effects, noncompact-source effects, directivity modeling, and extensions to the rotor supersonic tip-speed regime; (3) fan multiple-pure-tone in-duct sound pressure prediction methodology based on computational fluid dynamics (CFD) analysis; and (4) low-emissions combustor prediction methodology and computer code based on CFD and actuator disk theory. In addition, the relative importance of dipole and quadrupole source mechanisms was studied using direct CFD source computation for a simple cascade/turbine interaction problem, and an empirical combustor-noise correlation model was developed from engine acoustic test results. This work provided several insights on potential approaches to reducing aircraft engine noise. Code development is described in this report, and those insights are discussed.

Author

Research and Development; Noise Reduction; Aeroacoustics; Aerodynamic Noise; Aircraft Noise; Engine Noise

20000121142 NASA Glenn Research Center, Cleveland, OH USA

A Method to Further Reduce the Perceived Noise of Low Tip Speed Fans

Dittmar, James H., NASA Glenn Research Center, USA; October 2000; 28p; In English

Contract(s)/Grant(s): RTOP 523-24-13

Report No.(s): NASA/TM-2000-210457; E-12453; NAS 1.15:210457; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of low tip speed, high bypass ratio fans is a method for reducing the noise of turbofan jet engines. These fans typically have a low number of rotor blades and a number of stator vanes sufficient to achieve cut-off of the blade passing tone. Their perceived noise levels are typically dominated by broadband noise caused by the rotor wake turbulence - stator interaction mechanism. A 106 bladed, 1100 ft/sec takeoff tip speed fan, the Alternative Low Noise Fan, has been tested and shown to have reduced broadband noise. This reduced noise is believed to be the result of the high rotor blade number. Although this fan with 106 blades would not be practical with materials as they exist today, a fan with 50 or so blades could be practically realized. A noise estimate has indicated that such a 50 bladed, low tip speed fan could be 2 to 3 EPNdB quieter than an 18 bladed fan. If achieved, this level of noise reduction would be significant and points to the use of a high blade number, low tip speed fan as a possible configuration for reduced fan noise.

Author

Aerodynamic Noise; Noise Reduction; Jet Aircraft Noise; Fan Blades; Noise Intensity

20000120915 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Evaluation of Thermal Stability Improving Additives for Jet Fuel in Both Laminar and Turbulent Flow Test Units

Colbert, John E.; Nowack, Clarence J.; September 27, 2000; 20p; In English

Report No.(s): AD-A383363; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

All three TSIA's reduce the amount of thermal deposits, measured via carbon burnoff, in both laminar and turbulent test units for the three (3) different base fuels tested. For the laminar test unit, Betz 8Q462 shows better deposit inhibition than MDA by a narrow margin. Therefore, MDA shows a synergistic effect when added to the Betz 8Q406 (to produce Betz 8Q462) in the laminar unit.

DTIC

Thermal Stability; Additives; Jet Engine Fuels

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SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20000116147 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Design Concepts for Automating Maintenance Instructions *Final Report, 29 Jan. 1999-29 Feb. 2000*

Badler, Norman; Erignac, Charles; Vincent, Patrick; Sanchez, Edgar; Boyle, Edward S.; Feb. 2000; 80p; In English; Prepared in collaboration with TASC Inc., Fairborn, OH, and Boeing Co., St. Louis, MO.

Contract(s)/Grant(s): F33615-99-D-6001; AF Proj. 1710

Report No.(s): AD-A382162; AFRL-HE-WP-TR-2000-0088; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This task was performed under the Technology for Readiness and Sustainment (TRS) contract (F33615-99-D-6001) for the Air Force Research Laboratory (AFRL), Sustainment Logistics Branch (HESS) at Wright-Patterson AFB, OH. The period of research covered the time period 29 January 99 through 29 February 00. The primary objective of this task was to design, develop, and demonstrate a conceptual framework to support the automated validation and verification USAF technical orders (TOs), specifically job guide procedures for maintenance tasks. The outcome of this effort was the definition and demonstration of a conceptual framework for an application or system that could be used by TO authors and Air Force personnel to help validate and verify the safety and accuracy of job guide procedures in maintenance TOs. In addition, this task also produced a core set of critical research and development tasks considered essential to overcoming important barriers to the development of an automated TO validation and verification system or application.

DTIC

Data Management; Program Verification (Computers); Manuals; Aircraft Maintenance; Computer Assisted Instruction

18

SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences.

20000121168 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA USA

The 1998 Leonid Multi-Instrument Aircraft Campaign-An Early Review

Jenniskens, Peter, Search for Extraterrestrial Intelligence Inst., USA; Butow, Steven J., Search for Extraterrestrial Intelligence

Inst., USA; Meteoritics and Planetary Science; 1999; Volume 34, pp. 933-943; In English; Leonid MAC Workshop, 16-19 Apr. 2000, Tel Aviv, Israel

Contract(s)/Grant(s): RTOP 344-32-20; Copyright; Avail: Issuing Activity

The 1998 return of the Leonid shower was the target of the Leonid multi-instrument aircraft campaign (Leonid MAC), an unusual two-aircraft astronomical research mission executed near Okinawa, Japan. The prospect of a meteor storm brought 28 researchers of 7 nationalities together in a concerted effort to observe the shower by imaging, spectroscopic, and ranging techniques. This paper is a review of the major science issues that are behind the deployment of each of the present array of instruments and describes the interconnection of the various experiments. This was NASA's first astrobiology mission. The mission also aimed to study contemporary issues in planetary astronomy, in atmospheric sciences, and concerning the satellite impact hazard. First results of the participating observers are discussed and put in context, in preparation for the deployment of a planned second mission in November of 1999.

Author

Aircraft Instruments; Leonid Meteoroids

Subject Term Index

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